Telephony.

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Mr. Young, the Telephone and a Communications Merger

Telephone men will be keenly interested in the views expressed by Owen D. Young (to be found on a later page of this issue) at Washington when he appeared before the Senate committee considering the communications situation. The Couzens bill, providing for a federal communications commission, was the immediate proposition at issue, but Mr. Young covered the various branches of the communications field comprehensively.

Not only because of his commanding position in the radio industry, but because of his prominent connections in general business and world affairs, Mr. Young's opinions are of extreme importance.

His references to the telephone business were most complimentary and cannot fail to have a good effect on the industry. Although advocating a consolidation of radio and telegraph interests, Mr. Young is not in favor of including the telephone in such a unification. While not elaborating on this point much, he apparently believes the telephone is doing an excellent job right now in its particular field, and should not be interfered with.

* * * *

Mr. Young divides communications into two classes—those by speech, which he calls "voice" communications, and those in writing which he terms "record" communications. The "voice communications" represents the telephone, and he candidly says this class has made much greater progress than the "record communications," representing the telegraph.

His theory is that this is due to the fact that the telephone, in its particular field, as he views it, has had a monopoly, while there has been too much competition in the telegraph field to permit the research that leads to greater development.

* * * *

Undoubtedly Mr. Young did not mean to ignore the fact that there has been competition in the telephone business, in the early days when Bell and Independent groups were developing service. There was competition then within the industry, and it helped greatly to popularize the telephone.

Since the elimination of dual service, territory has been divided between the two groups and the whole telephone industry has been able to devote all its energy to improving and extending service.

The service competition in the telegraph business still continues, and, according to Mr. Young, has retarded progress, which may or may not be true. Inasmuch as Mr. Young is working for a consolidation of telegraph and radio interests he naturally argues that competition should be abolished in that field.

* * * *

The telegraph is some 40 years older than the telephone, and although "voice" communications seemed to present more difficulties than "record" communications, the former (the telephone) has advanced much more rapidly towards perfection.

"We must agree," says Mr. Young, "that the difficulties which have been overcome in the transmission of the voice have been much greater than the difficulties in the transmission of the record. That is to say, there has been not only much more rapid development, but much greater development, in the art of telephony than telegraphy. Much more effort and much more money have been put into research in telephony than in telegraphy."

Continuing his comparison, he pointed to the quicker service rendered by the telephone, and said that if the "record" communications were as prompt as telephone

GREETINGS!

To all its friends connected with the telephone industry, "Telephony" extends sincere wishes that the holiday season brings them a full measure of happiness and good cheer.

May their Christmas be a merry one, and may the New Year prove happy and prosperous in the best sense of the word!

This is the earnest hope of "Telephony's" staff, which will do its best to serve the telephone field effectively during 1930 as it has in the past.

service, they would be more in keeping with modern needs.

* * * *

Mr. Young also emphasized the point that the various forms of communications should supplement one another. Breakdowns in cables (as in the recent Atlantic earthquake) would call into play the radio service, while atmospheric disturbances which would interrupt the radio waves would demand the cooperation of cables and wires.

"These instrumentalities supplement each other," said he, "and should be, at some time in their development, so used. I may say, however, that although I believe in the unification of the telegraph services in one company under government control, I do not believe in the unification of the telephone and telegraph services in one company under the present development of the art."

In this belief Mr. Young differs from the late Theodore N. Vail, under whose leadership the American Telephone & Telegraph Co. purchased and operated for a time the Western Union Telegraph Co. At the direction of the United States government the Bell system relinquished the telegraph lines in 1913. This may be one of the reasons Mr. Young does not advocate such a merger today.

He did go on record as being opposed to the government owning and operating the communications, stating that he believed private companies can furnish the people the best and cheapest service. Mr. Young also said be thought it advisable to pass the Couzens bill, although he termed this an "offhand" opinion.

His views will receive consideration and provoke much discussion, but it does not follow that Congress will adopt them in framing legislation. The bare thought of helping create a monopoly of any kind is sufficient to throw a scare into a strong element in Congress, and has already aroused the fighting blood of interests which are outside the breastworks of the radio patent pool, and which claim such a monopoly would wreck their business and be in violation of the anti-trust laws.

COMING CONVENTIONS.

South Dakota Telephone Association, Watertown, Hotel Lincoln, January 14, 15 and 16.

Arkansas Telephone Association, Little Rock, Gleason Hotel, January 20 and 21.

Minnesota Telephone Association, Minneapolis, Radisson Hotel, January 28, 29 and 30.

Nebraska Telephone Association, Omaha, Hotel Paxton, February 11, 12 and 13.

Oklahoma Utilities Association, Tulsa, Mayo Hotel, March 11, 12 and 13.

Texas Independent Telephone Association, Fort Worth, Texas Hotel, March 18, 19 and 20.

Ohio Independent Telephone Association, Columbus, Hotel Deshler-Wallick, April 15, 16 and 17.

Indiana Telephone Association, Indianapolis, Claypool Hotel, May 6, 7 and 8.

Pennsylvania State Telephone & Traffic Association, Penn-Harris Hotel, Harrisburg, May 13, 14 and 15.

Up-State Telephone Association of New York, Rochester, May 21, 22 and 23.

Special Telephone Traffic Services

General Trend of Modern Development in Traffic Lines Towards Elimination of Routine Manual Labor, Yet Certain Special Services Are Still Necessary—Address From Traffic Conference of Annual National Association Convention

By E. L. Gaines,

Traffic Superintendent, The Home Telephone & Telegraph Co., Fort Wayne, Ind.

During recent years many functions of the traffic department have been changed or entirely eliminated by the introduction of automatic features on manual switchboards or by the substitution of the dial system for manually-operated plants. The general trend of development along all lines seems to be towards the elimination of as much routine manual labor as is possible.

A big start has already been made along these lines in handling local service, and it would not seem too fanciful to predict automatic operation of "Inward" and "Thru" long distance traffic in the future. It would seem, however, that certain telephone services are distinctly human services which must always be rendered by a thinking being.

These "special services" as applied to telephone traffic, include services rendered on all calls which are out of the ordinary routine and on which is required extra labor, equipment, or handling on the part of the telephone company. Under this heading may be listed all information and intercepting service, measured service, public and semi-public pay-station service, denied toll, multiple trunk group service, and in some cases reverting calls.

Some companies class repair calls as special services handled by the traffic department. In many cases repair calls are handled entirely by the plant department on special positions usually located near the test board. In some offices we find repair calls handled by the traffic department and the cost of the work divided between plant and traffic. Owing to the fact that repair services are generally conceded to be a plant function, they have been omitted from this discussion.

Information service was originally inaugurated to supplement directory service. New subscribers and subscribers who have had number changes not listed in the latest issue of the directory are enabled by information service to obtain practically the same service as subscribers whose correct names and numbers are in directory.

The advent of information service brought about demands from subscribers for still further service along this line, necessitating the compiling of other records than mere lists of names and numbers not contained in the latest directory. Subscribers' names were requested by number, as well as numbers by name. Street addresses were requested by name and by telephone number, and numbers and names were also requested by street addresses.

Telephone companies, perhaps overanxious to serve their patrons, indexed directories alphabetically, by telephone number and by street number. This, in turn, greatly increased the demand for this class of service and added to the cost of compiling and keeping records up to date.

Another practice which crept in and grew to such an extent as to become a burden to many operating companies, was that of furnishing the correct time of day to any subscriber who might ask for it. Today thousands of time calls are handled

every 24 hours in a number of exchanges.

Still another practice which had become common in some exchanges is what is termed "morning call service," in which the subscriber not only makes a timepiece out of the telephone but also uses it for an alarm clock. Upon retiring at night the subscriber leaves a "Morning Call" with the telephone operator in the same manner that a guest at a hotel leaves his "Morning Call" with the clerk.

In small offices the information clerk usually constitutes an information bureau for the entire community. She is personally acquainted with most of her subscribers who call her for information on every conceivable subject, ranging from dates in American history to cooking recipes. It is difficult to eliminate calls of this type in small offices. In larger exchanges, however, service of this kind is seldom given.

The decision as to just what information should be given to subscribers should be made by the management of the company. It is a matter of company policy and not a matter for the traffic head to decide upon. A number of large operating companies have eliminated the practice of giving any information to subscribers other than numbers not listed in the latest issue of the telephone directory.

Regulatory bodies have decided in some instances that the giving of miscellaneous information was not a proper function of a telephone operating company. According to one decision, telephone service should consist of furnishing means for communication and not of conducting a general information bureau for subscribers.

Certain telephone companies will not give out the names of subscribers when those names are requested by telephone numbers. These companies maintain that the number is the property of the subscriber and that he will give his name to anyone calling his number if he so desires. Newspaper "want ads" are frequently identified only by telephone number, because the person running the ad does not want his name published in connection with it. For the telephone company to give out the name upon request in such a case, is considered by some companies as breaking confidence with the subscriber.

Telephone regulating bodies have in some instances denied as a legitimate expense the cost of maintaining extra information files indexed by street number on the grounds that such service was extraordinary and not in line with the business of furnishing means for communication. Some telephone operating companies have discontinued the practice of giving out telephone numbers by street number because of the inconvenience occasioned its residence subscribers.

This inconvenience is brought about by being requested to call to the telephone some nearby neighbor who is not a subscriber. For example, John Smith living at No. 2126 Main street does not have a telephone; someone desiring to talk with John Smith asks the information operator for the number of the telephone nearest No. 2126 Main street. Upon being given the number the unfortunate neighbor is requested to call John Smith to the telephone. This practice, where permitted, is the cause of a great deal of annoyance to subscribers.

The giving of "Time Service" may be classed as nuisance service rather than giving of legitimate information. If a

"It Would Seem," Says Mr. Gaines, "That Certain Telephone Services Are Distinctly Human Services Which Must Always Be Rendered by a Thinking Being."

subscriber has only one time piece and it should stop, he usually has at least one friend living in the city who has a watch or a clock and upon whom he may call for the correct time.

In spite of the disadvantages in giving time service some large companies are still furnishing it to their subscribers. In manual offices time calls are frequently handled by the local operator without being referred to the information clerk.

In dial system offices regular information clerks may give time service if desired, or a special number may be set aside and subscribers requested to call this number for time service. In such cases special operators are employed who do nothing but give out the correct time of day. Phonograph attachments to clock mechanisms have been arranged to furnish this service without the aid of operators. Such devices, however, have never come into general use.

"Morning Call" service is an outgrowth of "Time Service" and has been entirely eliminated by the majority of large telephone companies. Courts have decided that telephone companies are liable for damages resulting from failure to make "Morning Calls" after promising to do so. Such decisions are probably responsible for the action of many companies in discontinuing this practice.

A practice which seems to be fair to everyone is for "Information" to give out only such numbers as are not correctly listed in the latest issue of the telephone directory. The subscriber is thus enabled to call any other subscriber, and the number of information calls is held down to a minimum. The discontinuance of giving out miscellaneous matter may not be welcomed by the average telephone subscriber, but as a rule will be accepted by him without protest if given the facts of the case in advance of the elimination of such services.

All of the foregoing regarding information service applies only to local service. It is usually advisable and necessary to give information service to long distance operators which is not given to regular subscribers. For example, it is not considered advisable by many companies to give the subscriber information that is contained in the latest issue of the directory, because it is information which he can readily obtain for himself and which he should not expect the telephone company employes to look up for him. On the other hand, it is very necessary that all numbers listed in the directory be accessible to long distance operators who require them to complete toll calls.

Local and long distance information was formerly kept separated, but standard practice today calls for both services to be rendered at the local information board. Separate groups of trunks from local and long distance boards enable information clerks to distinguish the type of service to be furnished.

In an office where no information is given local subscribers other than numbers not contained in the latest directory, the only record needed by the information clerk is an up-to-date directory. Such directories may be specially printed on one side of the paper only, the other side being left blank for new listings and changes, or it may be made by interleaving a regular directory with blank sheets.

A number of types of visible rotary files are on the market which are suitable for information work and which in large exchanges will usually effect a considerable saving in labor.

Handling information on manual and automatic plants is not necessarily different. In the case of manual service a subscriber asks the local operator for "information," and the local operator completes the call on a trunk to an information position.

Where the dial system is used a special number is assigned for "Information," and when this number is dialed by a subscriber, he is given access to the information clerks on an information trunk in the same manner as in the manual office. The work

of the information clerks is alike in both cases.

If a subscriber has more than one trunk line, the operator of a small board will remember the fact, and if the line called for is busy, will refer the call to the other line. On multiple switchboards, groups of lines to the same subscriber are usually underlined with paint on the multiple; and if the called line is busy, the call is transferred to another circuit in the group. Adjacent numbers in the same multiple jack level are usually assigned to a subscriber having more than one trunk line.

Multiple trunk group service is given with the dial system by means of rotary connectors which are arranged to rotate automatically from a busy trunk to the next trunk in the group. A busy signal is not returned to the subscriber unless all of the trunks in the group are busy. This equipment is arranged so that the subscriber is not limited to the number of trunks which he is allowed in a multipled group.

Intercepting service on calls to numbers which have been changed, or telephones that have been taken out, may be termed a part of regular information service, although handled in a different manner.

In the smallest offices the operators are supposed to remember such changes and give out the necessary information. On small manual multiple boards, straight-line number changes are usually handled by plugging the multiple jacks with white plugs carrying the new number of the party called. This method may also be used on two-party line changes where jack per station equipment is used.

Where there are more than two parties on a line, or where jack per station equipment is not used, the corners of the multiple jacks are marked to designate removals and changes. Some manufacturers arrange multiple switchboards in such a manner that small colored pins or markings may be attached to each corner of the multiple jacks to indicate number changes. When boards are not so arranged, it is necessary to designate the changes by color markings with paint on the face of the switchboard multiple.

Multiple Jack Markings.

Multiple jacks are sometimes made with depressions in the face of the jack strip to hold multiple marking paint. This type is usually more satisfactory than the plain jack face because the paint is not easily removed by contact with the switchboard plugs and cords and the markings remain legible for a longer period.

When a subscriber calls for a number that is marked in the multiple and the telephone has been taken out, the local operator may so inform the calling party. If the marking indicates that the number has been changed, however, it is necessary for the local operator to refer the call to an information operator who will give the new number.

In some such cases, changed number trunks are used instead of information trunks. When answering a changed number trunk, the information clerk asks what number the subscriber is calling; she then refers to a numerical changed number file from which she obtains the new number of the called party for the calling subscriber. This method is much faster than to look up the number in the alphabetical list.

In manual offices having large multiple jack per station boards, it is not practical to mark changed numbers in all sections of the multiple. On boards of this kind where a vacant multiple section is available, all changed numbers and take-outs are plugged on all excepting the vacant switchboard section. Trunks are provided from the "A" positions to the vacant section,

Foreign Service Section of Switchboard in the American Telephone & Telegraph Co.'s Long Distance Office at 24 Walker Street, New York City. The Designation at the Top of the Switchboard of Latest Additions to the Places Reached Appears in the Center and Reads, "Ship to Shore." This Service Opened on December 8 and Provides Commercial Service with the S.S. Leviathan from Any Telephone in the United States Until the Ship Is About 1,500 Miles Away from United States Shore.

which carries multiple plugs bearing all number changes.

Dial system offices arranged on the terminal per station basis, which is comparable with the jack per station basis in a manual office, are so arranged that the terminals of all changed numbers are connected direct to intercepting trunks terminating on the dial system "A" board, where intercepting service is given. Changed straight-line numbers are also connected to the dial system "A" board in the same manner.

Party line systems arranged on the terminal per line basis with selective ringing, make use of what is termed a traffic ringer to intercept calls on number changes and take-outs. A traffic ringer is connected in the central office on each line on which a change has been made, and so arranged that when the changed number is called, the call will automatically be thrown on an intercepting trunk while calls for other parties on the same lines will not be intercepted.

The terminal per station plan of intercepting is more convenient than the terminal per line plan from the standpoint of the telephone company insofar as central office equipment is concerned.

At the subscriber's end of the line, however, it is less convenient because it necessitates a card at each telephone on a party line indicating the directory numbers of all other parties on the line in order that each subscriber may know, when calling a number, whether or not that number is on his line. Keeping up these card records is an expensive and sometimes unsatisfactory method of handling the service.

When equipment is arranged on a jack per line basis, the subscriber is enabled to know what parties are on the same line with him by the similarity of the numbers.

Handling of Reverting Calls.

This leads us to the subject of reverting calls or calls from one party to another party on the same line. Where terminal per line equipment is used on either manual or automatic systems, the calling party knows from the similarity of numbers that the called party's telephone is on his own line. With manual operation, he asks the operator to ring this party on his own line. The operator requests him to hang up his receiver for a few moments while she rings.

Under automatic operation, after finding that the desired party is on the calling party's line, the calling party dials a special reverting call number, followed by a code derived from his own number and the number of the called party and hangs up his receiver. The bells on his own telephone as well as those on the telephone of the party he is calling, will then ring until the called party answers, or until the calling party removed his receiver to stop the ring.

In all cases where jack per station or terminal per station equipment is used, it is necessary to maintain individual instructions at each telephone carrying the numbers of other parties on the same line in order to enable a party to call another on the same line. This is unnecessary on either manual or automatic systems arranged on a terminal per line basis when modern equipment is used.

Some early automatic installations were not arranged for handling reverting calls automatically. In such exchanges arrangements were made for the subscribers to dial a special operator who would ring the desired party for him. This practice is satisfactory from a service standpoint, but entails unnecessary operating expense.

Measured Service Traffic.

Measured-service calls for special labor or equipment on the part of the telephone operating company in addition to that regularly supplied for flat rate service. One completed call is usually the unit on which charges are based.

It is necessary, therefore, for operators handling measured-service traffic to ticket each completed call on a two-number operating basis. This service, although fairly fast, requires more labor on the part of the operator than does unrecorded flat-rate calls. Calls to Information, Long Distance, Repair, or any calls to the telephone company, are not recorded or charged for.

Measured service handled on an automatic basis is simpler, insofar as the method of operation is concerned, than when handled manually. Additional equipment in the form of automatic meters and extra switch contacts is required, however, which is not the case under normal operation. The automatic meters for measured service are arranged to operate when the called party answers. If the calling party does not answer, the meter does not register. The operation of the meter is accomplished by the reversal of battery from the connector switch.

The equipment in the central office is so arranged that calls to Information, Repair, or the telephone company will not operate the meter and thus are not charged for. Fire, police and ambulance calls are handled in the same manner without charge by some telephone companies, although the majority of companies charge for such service. In all cases where automatic equipment is used for measured service, the meter is so arranged that it will not operate on a call incoming to the measured service subscriber.

Public Pay-Station Service.

Public pay-station service is given manually on either a prepay or postpay basis. On the prepay basis the subscriber must deposit a coin to signal the operator to place a call. On a local call the coin is collected when the called party answers, but held in suspense in the pay station until that time. If the called party does not answer, the pay-station operator depresses a refunding key which returns the coin to the subscriber.

The procedure is followed in making a long distance call, the long distance operator returning the coin or collecting the additional amount necessary if the called party is reached.

Prepay telephone operation is especially satisfactory from the standpoint of the operating company. In case of disputes as to the amount of money deposited by the calling party, the operator may refund all that has been deposited for the calling party to count and deposit again.

Postpay pay-station service may be given with more simple and less expensive equipment than prepay service, but requires more labor on the part of the operator and is more apt to give occasion for disputes over the amount of money deposited.

With postpay equipment a subscriber calls the operator in the usual manner, but does not deposit a coin until told to do so. If he is accustomed to using prepay equipment, he will then frequently claim that he has already deposited his coin, and it is impossible for the operator to tell whether he has done so or not. The stand taken by most telephone companies in such cases is that if he has made the mistake of depositing his money first, he should pay for his error.

Pay Station Operation.

Automatic operation of prepay public and semi-public pay stations is now coming into general use. With this system, the subscriber deposits a coin before he dials the number desired. When the called number answers, the coin is collected automatically. If the called number does not answer, the coin is returned to the subscriber automatically when he restores his receiver to its hook. The coin is also automatically returned when calling Information, Repair, Long Distance, or the telephone company.

On long distance calls the operator may collect or refund with a key the same as when operated on a manual basis. Postpay equipment may be used with automatic central office equipment for toll service, providing local service is on a free basis. When postpay equipment is used in an automatic office, the pay-station lines are usually terminated on a manual position either on the long distance board or the dial system "A" board.

A type of prepay equipment called the "nickel grabber" has recently come into use for local service on automatic systems. This equipment may be used on party lines as well as straight lines. It is so arranged that the telephone transmitter is disconnected from the telephone circuit until a coin is deposited.

In operation, the subscriber removes his receiver from the hook and dials his number in the usual manner. He can hear the called number answer, but can not talk until he deposits a coin, thus connecting his transmitter. If the called number does not answer, the coin of course is not deposited.

"MERRY CHRISTMAS MY FRIENDS, AND TO ALL GOOD CHEER . . . . "

From Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

Isn't it just great how we feel towards one another these December days before Christmas! The whole worldful of people seem like kin.

Mingling with the pungent fragrance of the evergreen and holly, can be heard the ringing of Salvation Army lassies' bells, the rattling of coins in kettles, insistent honk, honking of automobiles, tramp of hurrying feet, and fragments of conversation—all about Christmas and giving.

The spirit of Christmas seems to be shining with an everlasting radiance over all the world these days. Many happy faces mirror its reflection. Everyone seems kinder, happier and less selfish.

Perhaps the spirit of Christmas shines through all the year just as radiantly as it does now, only it is invisible to us until Christmas draws closer.

Though the holly fade, and the candles grow dim,
And bright Christmas memories wane,
The light and the warmth of sincere Christmas thoughts
Through all the next year will remain.

Public pay-station service is usually arranged so that incoming calls can not be received excepting when called by Long Distance. This may be accomplished on manual multiple switchboards by omitting the pay-station lines from the local multiple and having them appear only in the multiple before the toll "B" positions. In automatic offices the same end is attained by providing no local connectors on pay-station groups. Toll operators have access to pay-station groups, however, through the regular toll switch train and toll connectors.

Semi-public pay-station service differs from pay-station service in that the telephone numbers are listed in the telephone directory and are accessible by all local subscribers as well as by Long Distance, whereas public pay stations do not have numbers listed in the directory and are not accessible from other local telephones.

Incoming collect toll calls to pay stations must be collected at the "Inward" end of the circuit before the conversation because toll calls can not be billed against the pay station as is the case with flat-rate stations. On small non-multiple boards all pay-station lines are plainly marked so that the operator upon receiving an "In collect" call knows the called line is a pay-station and collects the proper amount.

On a multiple board where toll operators have access to the local multiple, pay-station lines are marked on the multiple. If toll "B" positions are provided, the pay-station lines are marked on the "B" multiple, and when called for by a toll operator the "B" operator furnishes the information that the called line is a pay-station line. When automatic equipment is used, a special tone is imposed on the pay-station line until the called number answers, to indicate to the "Inward" operator that the called number is a pay-station.

Denied toll service was formerly given by most companies to subscribers who did not want their telephones used for long distance purposes. On manual boards this was accomplished by a special marking on the line signal, indicating to the operator that the line was not to be connected to long distance. Toll multiple markings were also necessary to prevent "In collect" calls.

Denied toll was given over automatic systems by means of a special tone imposed on the subscriber's line when calling long distance. Only a limited number of telephone operating companies now limit the use of telephones to local calls. The majority of companies require subscribers to be responsible for all use of the telephone regardless of whether that use is local or long distance.

It will be seen from the foregoing that some of the services described are not strictly "special" in the sense the word was used in our opening remarks, because it is possible to eliminate them with automatic devices. They have been included, however, in order completely to cover services usually grouped together and the importance of which is sometimes overlooked.

As telephone service becomes less and less a human service and more and more a machine product, greater care must be exercised in its giving in order that the human touch, as exemplified in special service, may be of such a personal nature that the telephone user will not think of his telephone as a machine but rather as an animate link, capable of giving him instant communication with his fellow being wherever they may be located.

Sweezy Properties in Ohio Sold to Chicago Holding Company.

Control of 40 Ohio telephone and utilities companies is now vested in the Utilities Power & Light Co., of Chicago, one of the country's largest utility holding firms, through acquisition by it of the Suburban Light & Power Co. and the Utilities Service Co., both of Alliance, Ohio.

Under the merger, announced in Alliance December 9, according to an Associated Press dispatch, the Utilities Power & Light Co. will take over, in addition to the Suburban Light & Power and the Utilities Service, the General Light & Power, Alliance Power, the Stark Electric Railway, a number of rural telephone companies in central Ohio, and ice companies, including the Youngstown Ice & Fuel, Shory & Shellhase of Canton and Massillon, Springfield Ice & Coal and the Citizens Ice & Fuel of Toledo.

The Utilities Service Co., of which Everett W. Sweezy is president, owns or controls the following Ohio telephone companies:

Ada Telephone Exchange, Adamsville Telephone Co., Archbold Telephone Co., Beaver Dam Telephone Co., Berlin Center Telephone Co., Bluffton Telephone Co., Bucyrus Telephone Co., Citizens Telephone Exchange, Hamler; Citizens Telephone Co., Waterville; Crooksville Telephone Co., Crooksville; Damascus Telephone Co., Delphos Home Telephone Co., Deshler Farmers Mutual Telephone Co., Farmers Mutual Telephone Co., Ottawa; Frazeysburg Home Telephone Co., Green Spring Telephone & Electric Co., Jennings Telephone Co., Spencerville.

Kinsman Mutual Telephone Co., Lemoyne Telephone Co., Lima Telephone & Telegraph Co., Lyons Mutual Telephone Co., Metamora-Richfield Telephone Co., Napoleon Telephone Co., Northeast Ohio Telephone Co., Orangeville; Northwestern Telephone Co., Defiance; Northwestern Ohio Telephone Co., Wauseon; Oil Belt Telephone Co., Cygnet.

Palmyra Telephone Co., Diamond; People's Telephone Co., McConnellsville; Rush Creek Telephone Co., Junction City; Scott Home Telephone Co., Shelby Telephone Co., Swanton Home Telephone Co., Southeastern Ohio Telephone Co., Glouster; Van Wert Home Telephone Co., Waynesfield Telephone & Telegraph Co., Webster Telephone Co., Luckey; and Windham Electric Co.

Stockholders have until December 29 to ratify the proposed merger and the transaction is to be completed by next March 5.

Argues for Monopoly of Radio, Wires, Cable

Prepared Statement by Owen D. Young, Chairman of Board of RCA and General Electric to Senate Interstate Commerce Commission at Hearing on Communications Commission Bill—Domestic and International Communications

There is a great need for a definite policy with regard to our communications. I am deeply interested in it; first, as a citizen of the United States, interested like all other citizens; second, as chairman of the General Electric Co., because that company, like all other business concerns, is dependent for the carrying on and extension of its business, on communications; and third, as chairman of the Radio corporation, interested in the communications business, because no business is sound unless the service which it is rendering is the best the art permits—unless it is widely used and the rates are fair.

Large volume, with earnings enough to pay adequate wages, and profits enough to give an option on capital, is the slogan of modern American business. Any business which is not on that basis is not sound.

The best communications at lowest possible cost — that is our target. Wires and cables and radio, telephones and telegraph instruments, companies and organizations are only instrumentalities which we consider as means to the end we seek. Their investigation is not an end in itself; it is only an incident in the pursuit of our main inquiry.

Communications between human beings principally are carried on by speech or writing; that is to say, by voice or record. So I like to think of them, for purposes of classification, as voice communications and record communications. We are concerned with both kinds of communications here, only when the element of distance between the communicants enters into the situation. So long as I speak and you hear, there is no need for an intervening instrument.

Intervening Instrument a Problem.

Our communications present no problem here. So long as I can write a message to any one of you and hand it to you, it is no part of our problem here. So long, indeed, as I can write a message and the original piece of paper is delivered to you by messenger or mail, it is not part of our problem here. We are concerned with communications which require an intervening instrument in order that they may be had at all.

It is the use and control of those instruments with which we are primarily concerned.

How can we get the best instruments today? How can we get them tomorrow? How can we get them most widely distributed and conveniently located? How can we get them at least cost? How can we get the service of these instruments organized so that it will be the best for the whole people? That is our problem.

At the threshold of this inquiry is the question of whether such instrumentalities should be owned and developed—for we must never forget development—and operated by the government or by private concerns. The communication service is a service to the public, and therefore there is no reason in principle why it should not be owned and operated by the government, if that be the best way in which to get the most satisfactory communication service at the lowest cost.

That is to say, it is a public service business as distinguished from a purely private business. Our whole approach to the subject must be with that in mind.

I take it that the policy of the country is pretty well settled at present, and that the great preponderance of public opinion supports it—that we are not to put the government into any business, even a public service business, where such service can be rendered effectively and cheaply by private concerns under government regulation.

Our present communications services are being rendered by private concerns, under government regulation to a greater or less degree. I take it there is no thought of turning them over to the government, certainly at this time.

One who has had considerable experience with telephone systems all over the world, as I have, cannot fail to note the superiority of the telephone service in this country, administered by a private concern, over the telephone service in other countries, which are government-owned and operated.

I, for one, do not believe the time has come to turn our communications services over to the government; and, inasmuch as there is no large public sentiment demanding it, I assume that that question is not vital to the consideration of this committee at this time.

Therefore I will leave it and proceed to the consideration of how we can get the best communications at the least cost through private concerns.

Now let us look at our history again. Our communications by voice—that is, telephony—have been developed and are carried on by a company which is practically a monopoly under government regulation. Our communications by record—that is, telegraphy, as we know it—have been carried on by competitive companies, and on the whole with a minimum of government regulation.

It is natural to ask ourselves which of these two methods has produced the most satisfactory results. In order to measure them, we have to take account of the difficulties which had to be faced in the two kinds of communications. In a word, was one an easier job than the other?

Well, if we put ourselves back a hundred years, when neither existed, and someone should ask us which would be easier to do, transmission by record or transmission by human voice, by the use of electric current, we probably would have said: You could not do either, but if you can, it will be the record and not the voice which is transmitted.

As a matter of fact, the history of the development shows that the record was transmitted first, and that transmission of the voice came some 40 years later. Looking backward at the art, I think we must agree that the difficulties which have been overcome in the transmission of the voice have been much greater than the difficulties in the transmission of the record.

Language Barrier to Communications.

That is to say, there has been not only much more rapid development, but much greater development in the art of telephony than telegraphy. Much more effort and much more money have been put into research in telephony than in telegraphy.

What are the results? One can call from his desk or from his bedside almost any person in the United States, and in an amazingly short time carry on a perfect conversation with him. Indeed, one may call almost anybody in this Northern Hemisphere, or in the principal countries of Europe, and carry on a conversation, provided he can understand. It is language, not facilities, which is the barrier to such communication.

When one thinks of the convenience, speed, and vast distances over which communication by voice may be carried on, especially in this country, one must accept it as among the greatest, and perhaps the greatest, of human achievements in a great age.

It is no mere chance that the American Telephone & Telegraph Co. is the largest concern in the United States, both in investment, in stockholders and, I beleve, in employes. It is a reflection of public response to its service.

I pay this tribute to the American Telephone & Telegraph Co., not because I have any interest in it, direct or indirect, nor have any of the companies with which I am associated.

As a matter of fact, the General Electric and Westinghouse companies feel that in power and light they have made great developments. They would wish to stand first, and perhaps claim that position in

the service of the people. I say what I do about telephony under these circumstances because I am talking about communications and because I wish to acknowledge publicly the great service which has been rendered.

Telegraphy Highly Competitive.

If I want to send a communication by record—that is, a telegram—either from my office desk or from my bed, difficulties arise. I not only have to write my message, but I have to get it somewhere to a receiving telegraph office. It may be close, or it may be miles away. Messenger boys may be available or not. And when my message reaches the city in which the person lives to whom it is addressed, there is again the problem of delivery.

Meantime the speed of transmission has been none too great, compared with telephone service, and delays in these days are expensive. Would it not be highly satisfying if one could write his message on a special pad at his desk or his bedside, and have it quickly transmitted in facsimile or otherwise on a receiving pad in the office or house of the person to whom it was addressed?

If this could be done as promptly as we get telephone service, and could be done cheaply enough to be within the reach of all, then I should say our communications by record were keeping pace with our communications by voice. That they have not done so, I think must be admitted.

Again I say this, although the Radio corporation with which I am connected as chairman, is engaged in the telegraph business through the air, and, from my point of view, it, as well as the other companies, is not rendering a satisfactory service because there is not money enough and energy enough spent on research. Why not?

Well, I think it is in part because in telegraphy the business is highly competitive. So much energy and money have to be spent in getting the message today that it is difficult to divert money and energy to the problem of getting messages five years from today.

We must remember this research business is a matter of long-range planning, and large and highly speculative expenditure. It is developing rapidly, however, even in the competitive field; and I believe we will have more of it in telegraphy, even if we leave our companies competitive, than we have had in the past. I doubt, however, whether we will have as much or as rapid development as if all our telegraph services could be put in one company under adequate and effective governing regulation.

Duplication of Costs Highly Expensive.

As a matter of fact, getting regulation of rate and service by competition in the public service field has not been satisfactory in this country or elsewhere, and it has largely disappeared. Our own telegraph services are about the only one left in the world which continue that expensive and archaic method.

When we think that in order to establish two competitive telegraph systems, we must duplicate poles and wires overland and cables under sea, we must duplicate offices, equipment, and personnel from messenger boys to president, it is obvious that both the capital cost and the labor cost are vastly more than it would be were such duplication avoided.

Even granted that competition develops more effective management—and I think there is something to be said for that view—it is hopeless, under such circumstances, to expect the savings of management to be enough to offset such tremendous waste as results from duplication.

If, now, we are to add the duplicate services not only of one radio concern, but two or more, to the wire services which exist in telegraphy, and we establish four sets of offices and personnel, the competition will inevitably become ruinous, wages will be inadequate, capital will be lost, and ultimately services will be demoralized, all to the disadvantage of the people who really want the best communications at the lowest cost.

Under the competitive system our bill for communications, viewed from the standpoint of society, is bound to be disastrously large. Therefore both on the ground of quality of service, on the ground of research and development for service, and on the ground of ultimate cost to the community of service, I am forced to the conclusion that a single company, under adequate government regulation, can do our record communications service better and more cheaply than under the competitive system.

Radio and Cables Supplemental.

You will notice that I have not yet said anything about wires or cables or radio. I have not done so because I do not believe that the people of the United States have any interest in the question of agency which is used for their communications. What they want are adequate, cheap and reliable communications both by voice and record.

It is quite immaterial whether the transmission is by wires, above ground or below, by air or ether or crust of the earth. All these instrumentalities should be available and will be used by the company which has our public service to perform in carrying on record communications.

That company will use the best and cheapest instrument. One need have no fear about that; the whole history of our public service shows that much, at least. Engineers and managers of government-regulated monopolies have left no stone unturned to secure the lowest costs for services, if for no other reason than that they wish to keep ahead of the regulating authorities, and so insure or increase their returns.

So I think, not only that the telephone company should have wires and cables and radio available as instruments of public service, but that the record communication company which I visualize should similarly have such instrumentalities available for its service in order that the best may be used.

As a matter of fact, they supplement and insure each other. The break in half the cables in the Atlantic due to the recent earthquake demanded increased use of the facilities of the air to carry communications. Similarly atmospheric disturbances frequently interrupt or slow down radio, and cables should be available.

When sleet storms and tornadoes break our wires, the air should be opened to carry messages. These instrumentalities supplement each other and should be, at some time in their development, so used.

I may say here, that although I believe in the unification of the telegraph services in one company under government control, I do not believe in the unification of the telephone and telegraph services in one company under the present development of the art.

National Interest Held to Be Involved.

Whether or not what I have said is true regarding unification of the domestic telegraph service of the country, I am sure it is true in the field of international telegraph services. There, from the standpoint of national interest, a monopoly, either regulated by the government or owned by the government, is a necessity, and a necessity now.

If you have any hesitation about unifying our external communications in the hands of a private company under government control, then I beg of you, in the national interest, to unify them under government ownership in order that America may not be left, in the external communication field, subject to the dictation and control of foreign companies or governments.

At the time of the Treaty of Versailles, I have been told, the three things which all governments regarded as important for national protection and prestige were the control of (1) international transportation, (2) international communication, and (3) petroleum.

In international transportation I am told that America is not on a parity in merchant shipping with other countries, but I congratulate the Congress on the policy which it has adopted of encouraging American shipping. In the matter of petroleum, nature has given us a vast supply, but I confess to a feeling, without knowing much about the subject, that we are careless and wasteful of this great resource, and unless we take it sensibly in hand our sons will suffer for our prodigality. We need not deny ourselves the full use of the resource—we only need to prevent waste from a national point of view.

In the field of international communications Great Britain had developed, prior to

the war, as the binding cords of her great dominions, a cable system which was and is predominant. It was with this in mind that President Wilson asked for the conservation of our American rights and resources in the radio field, and made an appeal to Americans having such rights not to part with them, but to use them in establishing an international communication system for the United States.

It was in response to that appeal that the Radio Corp. of America was organized; and I assumed the responsibility, perhaps more than any other individual, of mobilizing our national radio resources in order that we might become an important factor in international communications.

In the field of international communications Great Britain has not only permitted but compelled such unification. France has done the same. Germany is in the process of doing it. Italy has unified control. Japan has both services unified under government control. How can our competitive companies in America—three of them or more—meet, from the standpoint of national interest, these consolidated units in other countries?

Any one of our three companies, to save itself from ruin in the international field, may be obliged to accept such terms as the unified interests may dictate to us. This may affect not only rates of service, but character of service. It may indeed affect quality of service.

I beg of you not to put the communication services of the United States, which are essential to the development and extension of our business in times of peace and always essential to the national defense, in a position where others may dictate to us here and we are powerless to protect ourselves. It was with this in mind as a first step, that I was instrumental in arranging for unification of the radio telegraph services with those of the International Telephone & Telegraph Corp., if and when the laws of the United States permit. I should like to see a similar arrangement made between the International company and the Western Union, so that Congress may know that the moment enabling acts are passed unification of these services could be had, under the control of the government of the United States.

If Congress does not pass the necessary enabling acts, it must take the responsibility of weakening, perhaps irretrievably, the position of the United States in the field of international communications. Parity is important to the United States in more fields than warships—in none more so than communications.

You will note that whenever I have spoken about unifying communication services, either in the domestic or in the international field, I have always attached to it the proviso that adequate regulation and control shall be put in the government of such services and the rates to be charged therefor. I have no doubt that effective regulations can be established, fair alike to the people rendering the services and to the people served. In fact, I may say that we must learn how to regulate adequately our public service in private hands, or there will be no alternative but the government ownership of such services.

A. T. & T. President Speaks on Prosperity

In Address at 25th Anniversary Celebration of Chicago Association of Commerce, President Walter S. Gifford of A. T. & T. Co. Discusses American Business Development and Indicates Future Trend—Telephone Practices Cited

At a dinner in Chicago on December 12, commemorating the 25th anniversary of the Chicago Association of Commerce, Walter S. Gifford, president of the American Telephone & Telegraph Co., delivered the address of the evening. The dinner, attended by about 1,000 of Chicago representative business men, was held at the Palmer House.

Among the guests seated at the speakers' table were Joseph B. Eastman of the Interstate Commerce Commission and the presidents of the Bell associate companies in the Middle West. Those present were: E. F. Carter, president of the Ohio Bell Telephone Co.; Burch Foraker, president of the Michigan Bell Telephone Co.; Curtis H. Rottger, president of the Indiana Bell Telephone Co.; W. R. McGovern, president of the Wisconsin Telephone Co.; W. B. T. Belt, president of the Northwestern Bell Telephone Co.; E. D. Nims, president of the Southwestern Bell Telephone Co.; and Bernard E. Sunny, chairman of the board, and W. R. Abbott, president of the Illinois Bell Telephone Co.; also Wm. P. Sidley, vice-president of the Western Electric Co.

Mr. Gifford spoke on the subject "Prosperity" and his address was broadcast over the Columbia chain.

Business has made impressive advance in applying to manufacture the secrets wrested by science from nature, he said. But its next step must be to eliminate the unemployment due to the very rapidity of our industrial progress. Big business must adjust itself to democracy and enter the field of human relations.

"Continued Improvement in the Standard of Living and in the General Welfare of This Country," Declared Mr. Gifford, "Is as Inevitable as the Tides of the Ocean."

Expounding the philosophy of American civilization, he said the high standard of living and well being for every one are as much a part of democracy as are politics and universal education. That was the keynote of a thesis in which he dwelt upon developments in science, natural resources, human relations, the character of America's man power and its organizing ability and imagination.

Advance Is Inevitable.

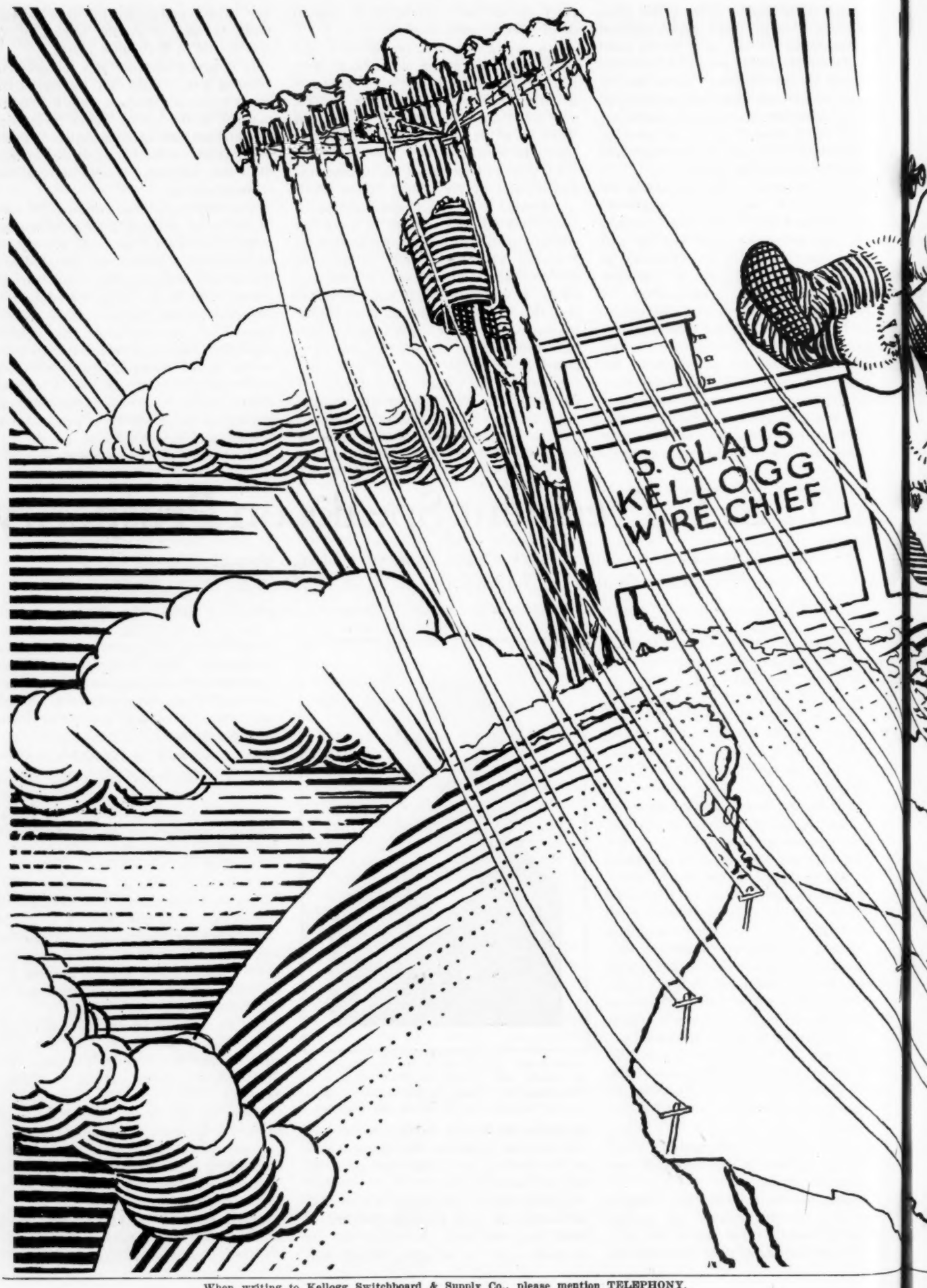
"Unless the temper and genius of our people are suddenly changed," Mr. Gifford stated, "unless their perceptions and aspirations are suddenly dulled, continued improvement in the standard of living and in the general welfare of this country is as inevitable as the tides of the ocean."

Foreign critics and domestic intelligentsia who delight to picture America as a land of dollar-chasers and a nation of machine tenders in a mechanical age and to sketch Uncle Sam as Uncle Shylock standing under three golden balls, were deprecated by Mr. Gifford.

"So far as I am aware," he said, "there is no organic law which has prevented other nations from making the same rate of industrial progress as has the United States.

"Many of our foreign friends and some of those in academic circles within our borders are openly critical of certain elements involved in our industrial development. This is sometimes called a mechanized nation, the implication being we are becoming a people of machine tenders—mere automatons—whose individualities are sub-

(*Continued on page* 24.)



When writing to Kellogg Switchboard & Supply Co., please mention TELEPHONY.

"Hello! Hello, everybody! This is S. Claus, Holiday Wire Chief for the Kellogg Switchboard & Supply Company. Just called to tell you how happy we are when we think over our pleasant associations of the past year . . . . "What's that? Fine! Thanks! And may we, too, sincerely wish for you a most happy holiday season . . . . "Yes, that's right, and we're planning to do our share toward making 1930 one of the best numbers you ever called . . . "Thank you! Thank you ever so much!
"Goodbye and good luck!"

Kellogg Switchboard and Supply Company

Chicago, Illinois

(*Continued from page* 21.)

merged under the passion for standardization.

Best Workmen in World.

"Such a conception is distorted in the extreme. Nowhere in the world is there a more progressive and more skilled body of workers than in this country. Nowhere in the world does the worker need to be more alert and observing. Nowhere does he have as much opportunity for material advancement, for mental development, for recreation and bodily exercise.

So far as the comforts of life are concerned, perhaps nowhere in the world is there less standardization than here.

It is, of course, true that large scale industrial operations have demanded the output of large volumes of products which are uniform in character. But limitations upon styles and varieties have been no more than those dictated by common sense.

I am not prepared to concede that the consumer in this country has a more restricted choice as to what he buys—whether it be a motor car or a pair of shoes—than the corresponding consumer in any other country.

Worship of the almighty dollar as an end in itself is distinctly on the decline, if it ever widely existed. Already mere money making on the part of the individual is receiving less and less recognition as a measure of success in life.

Already the approbation of business is turning more and more toward those leaders who are wise and constructive rather than ruthless and greedy opportunists, who seek to build fortunes without regard to the ultimate consequences affecting the public welfare.

Indeed, it is this changing tendency in sentiment which inspires me with absolute faith that our progress in the future will be even more brilliant than in the past."

Mr. Gifford pointed out that it is becoming more and more generally recognized that business has a distinct responsibility in providing that the economic readjustments demanded by industrial progress be effected with the greatest possible ease. Readjustment should not be allowed to generate maladjustment.

With the increased understanding of the problem of readjustment that has been developed in recent years and the further increases to come, he held there is "a sound basis for hope that our stumbling in the future will be more infrequent and less important."

"There is an increasing disposition on the part of the public to expect industry to make transitions as easy on the individuals concerned as possible, as well as to improve the processes of industry as a whole, and business accepts this responsibility," he said.

"Readjustment is the price of progress. Of course, with a civilization which involves intricate machinery and inter-dependent relationships, the result of given tendencies is not always obvious until too late to prevent some temporary hardships on the part of small groups of our population. By and large, however, the hazards of readjustment are avoidable. Such stumbling as we may witness along the road will be due not to acts of God but to the failure of man."

The telephone industry was cited to illustrate the type of American industrial progress.

"The telephone," Mr. Gifford continued, "was invented by Dr. Alexander Graham Bell only slightly more than 50 years ago. In that short time the telephone business has been so organized and developed here that today practically anybody, anywhere, can talk at any time of the day or night with anybody anywhere else, not only in the United States but in Mexico, Cuba, Canada and most of Europe.

"The ability to render a service of this magnitude rests upon a nation-wide organization, employing over 450,000 American men and women, operating physical properties representing an investment of four billions of dollars which are owned by more than 500,000 stockholders.

$700,000,000 in 1930 Program.

"The progress of the industry has been rapid, steady, continuous. We shall spend over $700,000,000 in 1930 for plant extensions, additions and betterments.

We are still making constant improvements in scope, speed and accuracy of the service, and the ultimate limits of progress seem as far away as ever. Only a few days ago we inaugurated a new service, telephoning to ships at sea.

Insofar as scientific knowledge is concerned, we have already conquered space and time so that it is possible technically to establish instantaneous communication between any two persons anywhere in the world, be either person or both on land, on sea or in the air.

These developments in the telephone industry have been taking place in other industries."

"Conquest of Nature."

"This country is engaged in a conquest of nature," Mr. Gifford declared. "The opportunities for conquest are unlimited, and success is shared by all. Scientific developments, partly evolved by laborious experimentation and scientific research and partly ignited by the spark of inventive genius, are constantly increasing the use of the bounties of nature in making available new products and new services which were not even dreamed of by the generation of our parents.

Full recognition of the potentialities of this cooperation with nature in which we are engaged is of the utmost importance, for the continued unrelenting prosecution of this kind of nature study makes for continued progress in the welfare and prosperity of our people."

The recent break in the stock market also came in for some attention. Commenting on that situation, Mr. Gifford said:

"Opportunistic speculation in the hope of quick profit, such as we have very recently witnessed, must more and more give way to systematic planning for the assurance of permanent gain. This is equally true of individuals and of business enterprises.

Planned Progress.

"'Planned progress' will not only facilitate the anticipation of coming readjustments but will tend to minimize such temporary fluctuations in the steady rate of business expansions as may still occur."

As an example of planned progress, he cited the five-year programs of the Bell companies.

"These programs," he stated, "are necessarily subject to modification from time to time, but we have found that the practice of looking at least five years ahead has resulted in much more steady economic progress than otherwise could have been possible. Other industries, I know, have also been taking similar steps to plan for the long pull. Indeed, the growth in the number of large business organizations is playing a large part in making such planning feasible."

"The sensational break in stock prices has recently engaged the attention of every one," he continued. "While this break has made it clear that the future progress of the United States cannot be discounted in the market to such an extent that any one period should unduly profit, it is my judgment that, for those who are willing to do their part in producing that progress, there has never been a place or time which offered such assurances as the United States does at present.

With an unusual abundance of natural resources; with a genius for invention and widespread organization for exhaustive, scientific research resulting, as it does, in a continual conquest of nature; with a people ambitious to achieve, universally educated, free from class prejudices and possessing unusual ability for practical organization; with a conception of government looking toward the well-being of all; with almost unbelievable developments in the way of new and more economical processes going forward in almost every industry, with science and the best methods of business organization being more generally adopted in the conduct of agriculture, with an improving recognition by management of its wider responsibilities and a growing recognition on the part of business and its possibilities for the public good—prosperity is not something to be adversely affected for an appreciable period of time by any of the maladjustments which temporarily beset the path of our orderly progress.

The facts speak for themselves and their logical results cannot and will not be altered except by a change in the character of the people of this country. We can, in my judgment, face the future with confidence."

Laws of Potential Drop in Conductors

The Total Weight of Copper and Permissible Potential Drop in an Automatic Exchange Power Circuit—Formulae With Actual Example of Application to Automatic Exchange Design—Part II. Application of Formulae in Practice

By A. Prado,

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There are two methods whereby ring-main circuit calculations may be treated. These are the "non-uniform" and the "uniform" cross-section methods of calculation.

"Non-Uniform" Cross-Section Method.

The non-uniform cross-section method is so termed because the cross-sectional area of the conductors forming the various sections of the ring-main, is not uniform throughout. The sectional area is only uniform for a particular section of the ring-main, but as we proceed around the ring, say along the portion *BFC* (Fig. 2), the area of the particular section is less than the area of the preceding one.

We have to determine, first of all, the normal position of the equipotential point,

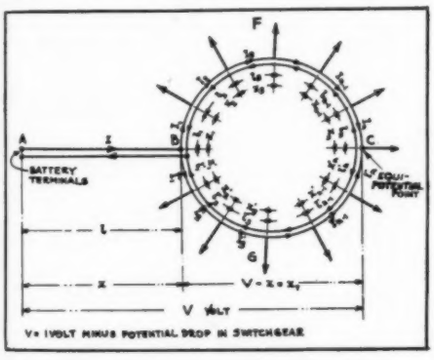

Fig. 2. Conditions of Investigation Concerning the "Ring Main Circuit."

by adjusting the currents and lengths of *BFC* and *BGC* (Fig. 2), so that the difference $LI_1 - L'I'_1$ may be as small as possible. Having done this, we determine the potential drop x_T across the ring-main from the formula,

$$x_T = \frac{V}{1+\sqrt{\frac{l^2 I}{P^2+P'^2}}} \quad \ldots\ldots\ldots (1A)$$

Where $P = l_1\sqrt{I_1} + l_2\sqrt{I_2} + l_3\sqrt{I_3} + \ldots\ldots + l_n\sqrt{I_n}$

and $P' = l'_1\sqrt{I'_1} + l'_2\sqrt{I'_2} + l'_3\sqrt{I'_3} + \ldots\ldots + l'_n\sqrt{I'_n}$

Also $I_1 > I_2 > I_3 > \ldots\ldots > I_n$

and $I'_1 > I'_2 > I'_3 > \ldots\ldots > I'_n$

It should be noted that V is equal to the total permissible potential drop from battery to apparatus minus the drop in switchgear, shunts, power board, bus-bars, etc.

We next determine the potential drop in each section forming the ring-main, by substituting l_1, I_1, l_2, I_2, l_3, I_3, ..., etc., for l_n, I_n, in the general formula.

$$x_n = x_T \frac{l_n\sqrt{I_n}}{P} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2A)$$

Thus we have for the first section in *BFC*, starting at *B*,

$$x_1 = x_T \frac{l_1\sqrt{I_1}}{P}$$

for the second section, $x_2 = x_T \frac{l_2\sqrt{I_2}}{P}$

for the third section, $x_3 = x_T \frac{l_3\sqrt{I_3}}{P}$ and so on.

From the relation $x = V - x_T$, we can calculate the potential drop in the loop from point *A* to point *B*. Having determined the various potential drops, the sectional area of the sections forming the complete circuit can be calculated. Instead of calculating the potential drops and sectional area for all sections of the ring-main, we can as an alternative make use of corollaries 1 and 2 of Part 1.

Thus, we determine the potential drop x_1, in the first section of the portion *BFC* of the ring-main from, $x_1 = x_T \frac{l_1\sqrt{I_1}}{P}$.

We next calculate the sectional area, a_1, for this section. Knowing a_1, we can determine a_2 for the second section, by formula,

$$a_2 = a_1\sqrt{\frac{I_2}{I_1}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3A)$$

Having calculated a_2, we determine a_3 for the third section, by formula

$$a_3 = a_2\sqrt{\frac{I_3}{I_2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4A)$$

and so on, until we come to the last or nth section in *BFC*, where we calculate a_n according to formula,

$$a_n = a_{n-1}\sqrt{\frac{I_n}{I_{n-1}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5A)$$

The procedure for the portion *BGC* of the ring-main is, of course, similar to the foregoing.

This alternative is more simple as regards calculation, although in certain cases may not be quite as convenient. The reason will be outlined later when working out an example.

The "Uniform" Cross-Section Method.

The uniform cross-section method is so termed because the cross-sectional area of the conductors forming *BFC* and *BGC*, respectively, is uniform. We determine the normal position of the equipotential point by the procedure given in the non-uniform method. We next calculate the potential drop x_T, across the ring-main from the formula,

$$x_T = \frac{V}{1+\sqrt{\frac{l^2 I}{LQ + L'Q'}}} \quad \ldots\ldots\ldots (6A)$$

Where

$L = l_1 + l_2 + l_3 + \ldots\ldots + l_n$

$L' = l'_1 + l'_2 + l'_3 + \ldots\ldots + l'_n$

$Q = l_1I_1 + l_2I_2 + l_3I_3 + \ldots\ldots + l_nI_n$

and

$Q' = l'_1I'_1 + l'_2I_2 + l'_3I'_3 + \ldots\ldots + l'_nI'_n$

As previously, V is equal to the total permissible potential drop from battery to apparatus minus the drop in switchgear, etc. From the relation, $x = V - x_T$, we calculate the potential drop in loop from point *A* to point *B*. We then calculate the sectional area a and a' of *BFC* and *BGC*, respectively by the formula,

$$a = \frac{kQ}{x_T} \quad \ldots\ldots\ldots\ldots\ldots (7A)$$ for *BFC*

where

$Q = l_1I_1 + l_2I_2 + l_3I_3 + \ldots\ldots + l_nI_n$

and $a' = \frac{kQ'}{x_T} \quad \ldots\ldots\ldots\ldots\ldots (8A)$ for *BGC*

where

$Q' = l'_1I'_1 + l'_2I'_2 + l'_3I'_3 + \ldots\ldots + l'_nI'_n$

The sectional area of *AB* is, of course, calculated from

$$\frac{k\,l\,I}{x} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9A)$$

We may now proceed to work out examples to illustrate the application of the foregoing methods of calculation.

Example 1: Calculate by the "Non-uniform" method, the cross-sectional area of the conductors forming the circuit shown in Fig. 6. Total potential drop in switchgear—i. e., battery circuit-breaker, power board, switchgear, shunts, etc.—may be taken as 0.26 volt.

Adjusting the lengths and currents in the ring-main, we determine the normal posi-

tion of the equipotential point C, making the difference $LI_1 - L'I'_1$, as small as practicable. Thus $205'\text{-}6'' \times 306$ amps. $= 176'\text{-}6'' \times 356$ amps. (nearly). To satisfy this condition, it will be observed that at the point C, 14 amps. and 4 amps. are drawn from BGC and BFC, respectively.

Having established the normal position of the equipotential point, we calculate the constants P^2, P'^2, I^2I and V in formula (1A).

Value of P: We have for BFC, $P = l_1\sqrt{I_1} + l_2\sqrt{I_2} + l_3\sqrt{I_3} + \ldots\ldots + l_n\sqrt{I_n}$.

Hence:

1st	section in BFC...	$5.5 \times \sqrt{306}$	$= 96.2$
2nd	section in BFC...	$12 \times \sqrt{276}$	$= 199.5$
3rd	section in BFC...	$12 \times \sqrt{246}$	$= 188.5$
4th	section in BFC...	$12 \times \sqrt{216}$	$= 176.5$
5th	section in BFC...	$12 \times \sqrt{186}$	$= 163.6$
6th	section in BFC...	$12 \times \sqrt{156}$	$= 150.0$
7th	section in BFC...	$12 \times \sqrt{126}$	$= 134.8$
8th	section in BFC...	$12 \times \sqrt{117}$	$= 130.0$
9th	section in BFC...	$12 \times \sqrt{108}$	$= 124.7$
10th	section in BFC...	$12 \times \sqrt{99}$	$= 119.5$
11th	section in BFC...	$12 \times \sqrt{90}$	$= 113.9$
12th	section in BFC...	$12 \times \sqrt{81}$	$= 108.0$
13th	section in BFC...	$12 \times \sqrt{72}$	$= 102.0$
14th	section in BFC...	$12 \times \sqrt{63}$	$= 95.3$
15th	section in BFC...	$12 \times \sqrt{54}$	$= 88.2$
16th	section in BFC...	$12 \times \sqrt{45}$	$= 80.5$
17th	section in BFC...	$11 \times \sqrt{36}$	$= 66.0$
18th	section in BFC...	$9 \times \sqrt{4}$	$= 18.0$
	Total		2155.2

$\therefore P = 2155.2$

and $P^2 = 2155.2^2 = 4{,}640{,}000$.

Value of P': We have for BGC,

$P' = l'_1\sqrt{I'_1} + l'_2\sqrt{I'_2} + l'_3\sqrt{I'_3} + \ldots\ldots + l'_n\sqrt{I'_n}$

Hence:

1st	section in BGC...	$5.5 \times \sqrt{356}$	$= 103.7$
2nd	section in BGC...	$9 \times \sqrt{338}$	$= 165.5$
3rd	section in BGC...	$9 \times \sqrt{320}$	$= 161.0$
4th	section in BGC...	$9 \times \sqrt{302}$	$= 156.3$
5th	section in BGC...	$9 \times \sqrt{284}$	$= 151.7$
6th	section in BGC...	$9 \times \sqrt{266}$	$= 146.8$
7th	section in BGC...	$9 \times \sqrt{248}$	$= 142.0$
8th	section in BGC...	$9 \times \sqrt{230}$	$= 136.5$
9th	section in BGC...	$9 \times \sqrt{212}$	$= 131.0$
10th	section in BGC...	$9 \times \sqrt{194}$	$= 125.3$
11th	section in BGC...	$9 \times \sqrt{176}$	$= 119.4$
12th	section in BGC...	$9 \times \sqrt{158}$	$= 113.1$
13th	section in BGC...	$9 \times \sqrt{140}$	$= 106.5$
14th	section in BGC...	$9 \times \sqrt{122}$	$= 99.4$
15th	section in BGC...	$9 \times \sqrt{104}$	$= 91.7$
16th	section in BGC...	$9 \times \sqrt{86}$	$= 83.5$
17th	section in BGC...	$9 \times \sqrt{68}$	$= 74.2$
18th	section in BGC...	$9 \times \sqrt{50}$	$= 63.7$
19th	section in BGC .	$9 \times \sqrt{32}$	$= 50.9$
20th	section in BGC...	$9 \times \sqrt{14}$	$= 33.7$
	Total		2255.9

$\therefore P' = 2255.9$

and $P'^2 = 2255.9^2 = 5{,}080{,}000$.

Value of I^2I:

$I^2I = 110^2 \times 662 = 8{,}000{,}000$.

Value of V: Total potential drop in switchgear $= 0.26$ volt.

$\therefore V = 1 - 0.26 = 0.74$ volt.

$$x_T = \frac{V}{1 + \sqrt{\dfrac{I^2I}{P^2 + P'^2}}}$$

Substituting the value of P^2, P'^2, I^2I and V in the formula, we have

$$x_T = \frac{0.74}{1 + \sqrt{\dfrac{8}{4.64 + 5.08}}} = 0.388$$

Hence $x_T = 0.388$ volt.

Knowing x_T we can now calculate the potential drop in the various sections forming BFC and BGC, respectively, by formula (2A), then calculate the cross-sectional area of the various sections.

Hence we have for BFC:

Section.	$x_n = x_T \dfrac{l_n\sqrt{I_n}}{P}$	
1	$x_1 = \dfrac{0.388 \times 96.2}{2{,}155.2}$	$= 0.0173$
2	$x_2 = \dfrac{0.388 \times 199.5}{2{,}155.2}$	$= 0.0359$
3	$x_3 = \dfrac{0.388 \times 188.5}{2{,}155.2}$	$= 0.0339$
4	$x_4 = \dfrac{0.388 \times 176.5}{2{,}155.2}$	$= 0.0318$
5	$x_5 = \dfrac{0.388 \times 163.6}{2{,}155.2}$	$= 0.02945$
6	$x_6 = \dfrac{0.388 \times 150}{2{,}155.2}$	$= 0.0270$
7	$x_7 = \dfrac{0.388 \times 134.8}{2{,}155.2}$	$= 0.02425$
8	$x_8 = \dfrac{0.388 \times 130}{2{,}155.2}$	$= 0.0234$
9	$x_9 = \dfrac{0.388 \times 124.7}{2{,}155.2}$	$= 0.02248$
10	$x_{10} = \dfrac{0.388 \times 119.5}{2{,}155.2}$	$= 0.0215$
11	$x_{11} = \dfrac{0.388 \times 113.9}{2{,}155.2}$	$= 0.0205$
12	$x_{12} = \dfrac{0.388 \times 108}{2{,}155.2}$	$= -0.01945$
13	$x_{13} = \dfrac{0.388 \times 102}{2{,}155.2}$	$= 0.01837$
14	$x_{14} = \dfrac{0.388 \times 95.3}{2{,}155.2}$	$= 0.01715$
15	$x_{15} = \dfrac{0.388 \times 88.2}{2{,}155.2}$	$= 0.01586$
16	$x_{16} = \dfrac{0.388 \times 80.5}{2{,}155.2}$	$= 0.0145$
17	$x_{17} = \dfrac{0.388 \times 66}{2{,}155.2}$	$= 0.01187$
18	$x_{18} = \dfrac{0.388 \times 18}{2{,}155.2}$	$= 0.00324$
	Total	$= 0.38792$

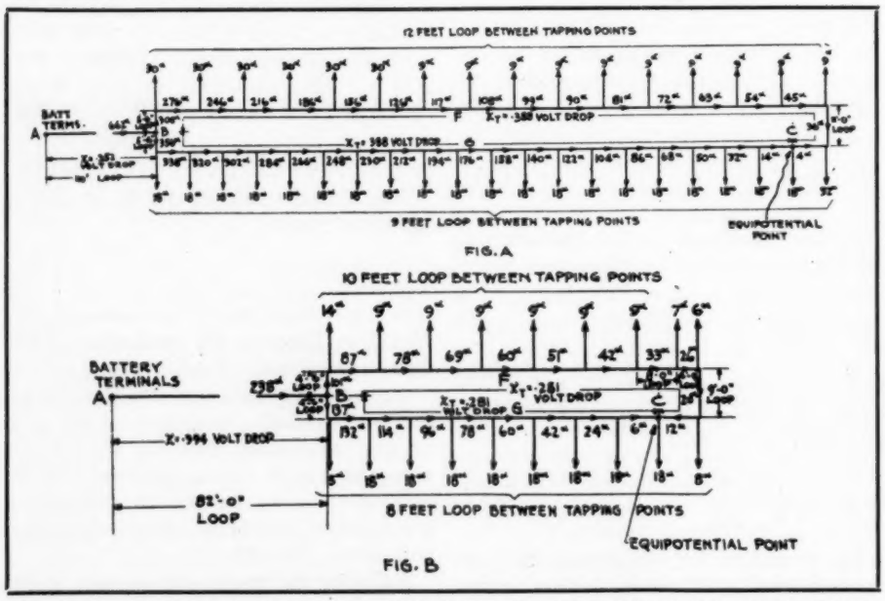

Fig. 6. Circuits Used in Examples of Calculation of Cross-Sectional Area of Conductors.

We now come to the loop circuit, AB. The potential drop in loop from point A to point B is, $x = .74 - .388 = .352$ volt.

Sectional area of conductor forming loop $= \dfrac{0.00000831 \times 110 \times 662}{0.352} = 1.716$ square inches.

We can, as an alternative, make use of corollaries 1 and 2 (formulae 3A to 5A) for the calculation of the cross-sectional area of the various sections forming BFC and BGC.

Thus considering BFC, we determine the potential drop and sectional area of the first section. These we have already worked out to be 0.0173 volt and 0.808 square inch respectively.

Hence we have, 2nd section in BFC—

$$a_2 = a_1 \sqrt{\frac{I_2}{I_1}}$$

$$a_n = \frac{.00000831 \times l_n \times I_n}{x_n} \text{ sq. in}$$

$$a_1 = \frac{0.00000831 \times 5.5 \times 306}{0.0173} = 0.808$$

$$a_2 = \frac{0.00000831 \times 12 \times 276}{0.0359} = 0.766$$

$$a_3 = \frac{0.00000831 \times 12 \times 246}{0.0339} = 0.723$$

$$a_4 = \frac{0.00000831 \times 12 \times 216}{0.0318} = 0.677$$

$$a_5 = \frac{0.00000831 \times 12 \times 186}{0.02945} = 0.627$$

$$a_6 = \frac{0.00000831 \times 12 \times 156}{0.0270} = 0.576$$

$$a_7 = \frac{0.00000831 \times 12 \times 126}{0.02425} = 0.5175$$

$$a_8 = \frac{0.00000831 \times 12 \times 117}{0.0234} = 0.4975$$

$$a_9 = \frac{0.00000831 \times 12 \times 108}{0.02248} = 0.479$$

$$a_{10} = \frac{0.00000831 \times 12 \times 99}{0.0215} = 0.4585$$

$$a_{11} = \frac{0.00000831 \times 12 \times 90}{0.0205} = 0.437$$

$$a_{12} = \frac{0.00000831 \times 12 \times 81}{0.01945} = 0.415$$

$$a_{13} = \frac{0.00000831 \times 12 \times 72}{0.01837} = 0.390$$

$$a_{14} = \frac{0.00000831 \times 12 \times 63}{0.01715} = 0.366$$

$$a_{15} = \frac{0.00000831 \times 12 \times 54}{0.01586} = 0.339$$

$$a_{16} = \frac{0.00000831 \times 12 \times 45}{0.0145} = 0.309$$

$$a_{17} = \frac{0.00000831 \times 11 \times 36}{0.01187} = 0.277$$

$$a_{18} = \frac{0.00000831 \times 9 \times 4}{0.00324} = 0.0922$$

$\therefore\ a_2 = .808\sqrt{\frac{276}{306}} = 0.766$ square inch

3rd section in *BFC*—

$$a_3 = a_2\sqrt{\frac{I_3}{I_2}}$$

$\therefore\ a_3 = 0.766\sqrt{\frac{246}{276}} = 0.723$ square inch

4th section in *BFC*—

$$a_4 = a_3\sqrt{\frac{I_4}{I_3}}$$

$\therefore\ a_4 = .723\sqrt{\frac{216}{246}} = 0.677$ square inch

and so on until we get to the last section in *BFC*.

The procedure for the portion *BGC* of the ring-main is, of course, similar to the foregoing.

We have for *BGC*:

Section.	$x'_n = x_T \frac{I'_n\sqrt{I'_n}}{P'}$	$a'_n = \frac{0.00000831 \times I'_n \times I'_n}{x'_n}$ sq. ins.
1	$x'_1 = \frac{0.388 \times 103.7}{2{,}255.9} = 0.01786$	$a'_1 = \frac{0.00000831 \times 5.5 \times 356}{0.01786} = 0.910$
2	$x'_2 = \frac{0.388 \times 165.5}{2{,}255.9} = 0.0285$	$a'_2 = \frac{0.00000831 \times 9 \times 338}{0.0285} = 0.887$
3	$x'_3 = \frac{0.388 \times 161}{2{,}255.9} = 0.0277$	$a'_3 = \frac{0.00000831 \times 9 \times 320}{0.0277} = 0.863$
4	$x'_4 = \frac{0.388 \times 156.3}{2{,}255.9} = 0.0269$	$a'_4 = \frac{0.00000831 \times 9 \times 302}{0.0269} = 0.840$
5	$x'_5 = \frac{0.388 \times 151.7}{2{,}255.9} = 0.0261$	$a'_5 = \frac{0.00000831 \times 9 \times 284}{0.0261} = 0.813$
6	$x'_6 = \frac{0.388 \times 146.8}{2{,}255.9} = 0.02525$	$a'_6 = \frac{0.00000831 \times 9 \times 266}{0.02525} = 0.7875$
7	$x'_7 = \frac{0.388 \times 142}{2{,}255.9} = 0.02441$	$a'_7 = \frac{0.00000831 \times 9 \times 248}{0.02441} = 0.76$
8	$x'_8 = \frac{0.388 \times 136.5}{2{,}255.9} = 0.02348$	$a'_8 = \frac{0.00000831 \times 9 \times 230}{0.02348} = 0.733$
9	$x'_9 = \frac{0.388 \times 131}{2{,}255.9} = 0.02252$	$a'_9 = \frac{0.00000831 \times 9 \times 212}{0.02252} = 0.704$
10	$x'_{10} = \frac{0.388 \times 125.3}{2{,}255.9} = 0.02153$	$a'_{10} = \frac{0.00000831 \times 9 \times 194}{0.02153} = 0.673$
11	$x'_{11} = \frac{0.388 \times 119.4}{2{,}255.9} = 0.02053$	$a'_{11} = \frac{0.00000831 \times 9 \times 176}{0.02053} = 0.641$
12	$x'_{12} = \frac{0.388 \times 113.1}{2{,}255.9} = 0.01945$	$a'_{12} = \frac{0.00000831 \times 9 \times 158}{0.01945} = 0.6075$
13	$x'_{13} = \frac{0.388 \times 106.5}{2{,}255.9} = 0.01832$	$a'_{13} = \frac{0.00000831 \times 9 \times 140}{0.01832} = 0.571$
14	$x'_{14} = \frac{0.388 \times 99.4}{2{,}255.9} = 0.0171$	$a'_{14} = \frac{0.00000831 \times 9 \times 122}{0.0171} = 0.533$
15	$x'_{15} = \frac{0.388 \times 91.7}{2{,}255.9} = 0.01578$	$a'_{15} = \frac{0.00000831 \times 9 \times 104}{0.01578} = 0.492$
16	$x'_{16} = \frac{0.388 \times 83.5}{2{,}255.9} = 0.01436$	$a'_{16} = \frac{0.00000831 \times 9 \times 86}{0.01436} = 0.4475$
17	$x'_{17} = \frac{0.388 \times 74.2}{2{,}255.9} = 0.01275$	$a'_{17} = \frac{0.00000831 \times 9 \times 68}{0.01275} = 0.399$
18	$x'_{18} = \frac{0.388 \times 63.7}{2{,}255.9} = 0.01095$	$a'_{18} = \frac{0.00000831 \times 9 \times 50}{0.01095} = 0.341$
19	$x'_{19} = \frac{0.388 \times 50.9}{2{,}255.9} = 0.00876$	$a'_{19} = \frac{0.00000831 \times 9 \times 32}{0.00876} = 0.2432$
20	$x'_{20} = \frac{0.388 \times 33.7}{2{,}255.9} = 0.00580$	$a'_{20} = \frac{0.00000831 \times 9 \times 14}{0.00580} = 0.1805$
Total	$= 0.38805$	

To simplify construction, it may be necessary to make several sections uniform in cross-sectional area. In order to insure that this may be effected efficiently, it is essential that the potential drop in the various sections should be known. It is for this reason that the alternative calculation just outlined is not quite so convenient as the potential drops would have to be worked out from the sectional areas.

Let us consider the portion *BFC*, and arrange for every three sections to be uniform in cross-sectional area. The cross-sectional area of the conductor forming any number of sections can be obtained by an application of formula (7A), modified to agree with the number of sections and total potential drop in these sections.

Thus for three sections we have,

$$\text{sectional-area} = \frac{k(l_1I_1 + l_2I_2 + l_3I_3)}{x_1 + x_2 + x_3}$$

For four sections,

$$\text{sectional-area} = \frac{k(l_1I_1 + l_2I_2 + l_3I_3 + l_4I_4)}{x_1 + x_2 + x_3 + x_4}$$

And for n sections,

$$\text{sectional-area} = \frac{k(l_1I_1 + l_2I_2 + l_3I_3 + \ldots\ldots + l_nI_n)}{x_1 + x_2 + x_3 + \ldots\ldots + x_n};$$

which, of course is the original formula (7A).

The value of k in the foregoing formulae is 0.00000831. Hence, considering *BFC*, we have for:

Sections 1, 2, 3:

$$a_{1-3} = \frac{0.00000831\ (\ 5.5\times 306 + 12\times 276 + 12\times 246)}{0.0173 + 0.0359 + 0.0339} = 0.757 \text{ sq. in.}$$

Sections 4, 5, 6:

$$a_{4-6} = \frac{0.00000831\ (12\ \times 216 + 12\times 186 + 12\times 156)}{0.0318 + 0.0294 + 0.0270} = 0.630 \text{ sq. in.}$$

Sections 7, 8, 9:

$$a_{7-9} = \frac{0.00000831\ (12\ \times 126 + 12\times 117 + 12\times 108)}{0.0242 + 0.0234 + 0.0224} = 0.500 \text{ sq. in.}$$

Sections 10, 11, 12:

$$a_{10-12} = \frac{0.00000831\ (12\ \times 99 + 12\times 90 + 12\times 81)}{0.0215 + 0.0205 + 0.0194} = 0.438 \text{ sq. in.}$$

Sections 13, 14, 15:

$$a_{13-15} = \frac{0.00000831\ (12\ \times 72 + 12\times 63 + 12\times 54)}{0.0183 + 0.0171 + 0.0158} = 0.368 \text{ sq. in.}$$

Sections 16, 17, 18:

$$a_{16-18} = \frac{0.00000831\ (12\ \times 45 + 11\times 36 + 9\times 4)}{0.0145 + 0.0118 + 0.00324} = 0.273 \text{ sq. in.}$$

Let us now consider the portion *BGC*, and arrange for every four sections to be uniform in cross-sectional area.

Sections 1, 2, 3, 4:

$$a_{1-4} = \frac{0.00000831\ (5.5\times 356 + 9\times 338 + 9\times 320 + 9\times 302)}{0.0178 + 0.0285 + 0.0277 + 0.0269} = 0.871 \text{ sq. in.}$$

Sections 5, 6, 7, 8,

$$a_{5-8} = \frac{0.00000831\ (9\ \times 284 + 9\times 266 + 9\times 248 + 9\times 230)}{0.0261 + 0.0252 \times 0.0244 + 0.0234} = 0.776 \text{ sq. in.}$$

Sections 9, 10, 11, 12:

$$a_{9-12} = \frac{0.00000831\ (9\ \times 212 + 9\times 194 + 9\times 176 + 9\times 158)}{0.0225 + 0.0215 + 0.0205 + 0.0194} = 0.658 \text{ sq. in.}$$

Sections 13, 14, 15, 16:

$$a_{13-16} = \frac{0.00000831\ (9\ \times 140 + 9\times 122 + 9\times 104 + 9\times 86)}{0.0183 + 0.0171 + 0.0157 + 0.0143} = 0.516 \text{ sq. in.}$$

Sections 17, 18, 19, 20:

$$a_{17-20} = \frac{0.00000831\ (9\ \times 68 + 9\times 50 + 9\times 32 + 9\times 14)}{0.0127 + 0.0109 + 0.0087 + 0.0058} = 0.322 \text{ sq. in.}$$

Example 2: Calculate by the "uniform" method, the cross-sectional area of the conductors forming the circuit shown in Fig. 6A. Total potential drop in switchgear, i. e., main battery fuse, power board switchgear, shunts, etc., may be taken as 0.325 volt.

Equipotential point: To determine the normal position of this point, we proceed as in example 1. Thus 93′-6″ × 101 amps. = 68′-6″ × 137 amps. (nearly).

Having established the normal position of the equipotential point we calculate the constants QL, $Q'L'$, I^2I and V in formula (6A).

Value of QL for *BFC*:

$$Q = l_1I_1 + l_2I_2 + l_3I_3 + \ldots\ldots + l_nI_n$$

$$L = l_1 + l_2 + l_3 + \ldots\ldots + l_n$$

Hence:		Q	L
1st	section in *BFC*. 4.5 × 101 =	454.5	4.5
2nd	section in *BFC*. 10 × 87 =	870	10
3rd	section in *BFC*. 10 × 78 =	780	10
4th	section in *BFC*. 10 × 69 =	690	10
5th	section in *BFC*. 10 × 60 =	600	10
6th	section in *BFC*. 10 × 51 =	510	10
7th	section in *BFC*. 10 × 42 =	420	10
8th	section in *BFC*. 8 × 33 =	264	8
9th	section in *BFC*. 4 × 26 =	104	4
10th	section in *BFC*. 9 × 20 =	180	9
11th	section in *BFC*. 8 × 12 =	96	8
Totals	..... =	4,968.5	93.5

Hence $QL = 4968.5 \times 93.5 = 464000$.

Value of $Q'L'$, for *BGC*:

$$Q' = I'_1I'_1 + I'_2I'_2 + I'_3I'_3 + \ldots\ldots + I'_nI'_n$$

$$L' = I'_1 + I'_2 + I'_3 + \ldots\ldots + I'_n$$

Hence:

		Q'	L'
1st	section in *BGC*. . 4.5 × 137 =	616.5	4.5
2nd	section in *BGC*. . 8 × 132 =	1,056	8
3rd	section in *BGC*. . 8 × 114 =	912	8
4th	section in *BGC*. . 8 × 96 =	768	8
5th	section in *BGC*. . 8 × 78 =	624	8
6th	section in *BGC*. . 8 × 60 =	480	8
7th	section in *BGC*. . 8 × 42 =	336	8
8th	section in *BGC*. . 8 × 24 =	192	8
9th	section in *BGC*. . 8 × 6 =	48	8
Total	.....	5,032.5	68.5

Hence $Q'L' = 5{,}032.5 \times 68.5 = 345{,}000$.

Value of I^2I:

$I^2I = 82^2 \times 238 = 1{,}600{,}000$.

Value of V:

$V = 1$ volt $- 0.325$ volt $= 0.675$.

$$x_T = \frac{V}{1 + \sqrt{\dfrac{I^2I}{LQ + L'Q'}}}$$

Substituting the value of LQ, $L'Q'$, I^2I and V in the formula we have

$$x_T = \frac{.675}{1 + \sqrt{\dfrac{1.6}{.464 + .345}}} = 0.281$$

Hence $x_T = 0.281$ volt.

Knowing x_T we can now calculate the sectional area of *BFC* and *BGC*, respectively, by formulae (7A) and (8A). For *BFC* we have $a = \dfrac{0.00000831\ Q}{x_T}$.

Hence $a = \dfrac{0.00000831 \times 4{,}968.5}{0.281} = 0.1468$ sq. in.

For *BGC* we have $a' = \dfrac{0.00000831\ Q'}{x_T}$.

Hence $a' = \dfrac{0.00000831 \times 5{,}032.5}{0.281} = 0.1488$ sq. in.

Loop circuit *AB*: Potential drop in loop from point *A* to point *B* is,

$x = 0.675 - 0.281 = 0.394$ volt.

Sectional area of conductor forming loop,

$$= \frac{0.00000831 \times 82 \times 238}{0.394} = 0.412 \text{ sq. in.}$$

(To be concluded.)

Congress Extends Life of Radio Commission Indefinitely.

Both the Senate and the House on December 16, passed bills to extend the life of the Federal Radio Commission indefinitely.

The measures were similar, but the Dill bill, passed by the Senate, provides for the appointment by the commission of a chief engineer at an annual salary of $10,000 a year and for two assistants at salaries of $7,500. In consequence, the measure must go to conference for an adjustment of these differences.

The effect of the legislation is to establish as a permanent policy the regulation of radio by an independent commission of five members rather than by the Department of Commerce. The original legislation of February 23, 1927, contemplated that the commission should be vested with primary jurisdiction only for a period of one year. Its authority was twice extended for periods of one year and now is made indefinite. The Department of Commerce will continue as an administrative agency to carry out policies of the commission.

Prices in the Metal Markets.

New York, December 16: Copper—Quiet. Electrolytic, spot and future, 18c. Iron—Quiet, No. 2 f.o.b. eastern Pennsylvania, $20@21; Buffalo, $17@18; Alabama, $12@14. Tin—Firm, spot and nearby, $41.75; future, $42.37. Lead—Steady. Spot, New York, 6.25c; East St. Louis, 6.10c. Zinc—Easy. East St. Louis spot and future, 5.65c. Antimony, $8.50. Quicksilver—$124.00.

Here and There in Telephone Work

Christmas Banquet of Girls' Educational Group of Ft. Wayne, Ind.

"We of this age of miracles, who are in danger of losing our sense of wonder, of adventure, and of appreciation of effort, should continue our education, which is nothing more than a lifelong process of discovery of one's self and of one's world, and a continual adjustment of one's self to one's world. You have never finished your education."

The speaker was Miss Ruth R. Hawkins, general secretary of the Fort Wayne, Ind., Y. W. C. A.; the time, the Christmas banquet of the Girls' Educational Group of the Home Telephone & Telegraph Co. at Fort Wayne; and the place, the banquet room of the Woman's Club in the Chamber of Commerce building.

It was a delightful occasion and a fitting climax to the first year of the Girls' Educational Group of the Home company. The spirit of the Christmas season was carried out in the decorations. Evergreen branches and holly were in evidence around the room silhouetted against a snow-like background. Gayly-lighted Christmas trees graced the table. Nearly 100 girls heard Miss Hawkins praise the movement whereby groups are organized for social intercourse and welfare and tell of the benefits derived from such organization.

Just one year ago all the girl employes of the company attended a meeting which proved to be the beginning of what is now a group of enthusiastic girl employes holding monthly business and educational discussions, as well as social programs. The discussions have proved beneficial to all.

Miss Cecilia Holsinger, secretary to the general manager, was made chairman of the meetings and Miss Florence Wisman, clerk in the accounting department, secretary. These two girls, together with others who are appointed monthly to assist in arranging the social hour following the meetings, deserve much credit for the success of the first year's activities.

During the past year girls representing the different departments of the company presented papers, which they prepared themselves, on the following subjects: History of the company, commercial, toll commercial, traffic, plant and accounting practices, company insurance plans for employes and company budget. Discussions followed on the immediate topics, and girls were asked to give their views on the company practices. This served to increase the knowledge of the group members and instill confidence in them for their work.

In connection with these papers tours of inspection of the different departments are made, forms in use displayed, new equipment exhibited and moving pictures shown. All this has served to enlighten the girls on every phase of their company's work, and has resulted in more cooperation being shown in daily business between the different departments of the company.

The group also studied and discussed at each monthly meeting, excerpts of the company's office manual, which covers employes' relations with the company, with each other, with subscribers and with the public in general. Rules and regulations as outlined by the company were illustrated and instructions in phases of business such as rates, letter writing and business English were emphasized.

So successful has been the first year of the group that the girls are eagerly looking forward to activities in the new year. It is likely that as soon as the girls are acquainted with all of the different departments of the company and the operating methods of each, outside speakers will be featured at the monthly meetings.

Meetings are held regularly on the first Tuesday of every month. Following the dinner, which is served at 5:30 o'clock, the business meeting is called to order. Subjects are brought up by speakers who have received assignments and the general discussion follows.

The social hour, which follows and concludes the meeting, is featured by bridge, pinochle and bunco games. This has served to acquaint the girls of all departments intimately. The athletic association of the company contributes attractive prizes which are awarded to the winners of the table games.

All in all, it has served to better acquaint all the girls with their co-employes, their company and its operations, and has caused a wholesale good feeling to exist around the company offices.

"Wonder Whys" of an Observing Traveling Telephone Engineer.

By Ray Blain.

I wonder why so many of the smaller telephone companies still cling to the practice of running aerial cable into all buildings requiring a number of telephone lines.

The Girls' Educational Group of the Home Telephone & Telegraph Co. at Fort Wayne, Ind., Celebrated Completion of Its First Year As An Organization with a Christmas Banquet.

This is especially noticeable where the courthouse is located in the public square and a long span of cable is run from one side of the square, usually to the attic of the building. The cable is, of course, run to the highest point on the building for the purpose of obtaining proper clearance over the street, but this is likewise the most difficult point to handle the distribution from inside the building.

This long span does everything except add beauty to the building, which is generally one of the show places of the town. It is useful only for the most nervy squirrel to show off on, but it is likewise difficult to get a lineman to ride the span, unless he be a little squirrely himself.

It is much cheaper, and generally easier, to feed such buildings with an underground cable. This cable can be just the ordinary type buried without conduit, can be laid in conduit or, better still, make use of a piece of steel armored cable. Either type will make a real job if properly installed.

The changing of any of these aerial spans to underground will stamp a telephone company as progressive and will usually bring favorable publicity from the city fathers through the local newspapers.

Ship to Shore Telephone Service of the Leviathan.

During the trip last week of the S. S. Leviathan from New York to England, more than 300 conversations were carried on with America, of which one-quarter were paid for at the rate of $21 for a three-minute talk. There were also calls from shore to ship, from as far west as Indianapolis, Ind.

Every message was heard on both ends perfectly with a single exception when atmospheric conditions caused a break of a few minutes, after which all went well. The average time between the passenger's filing the number aboard the Leviathan and connection with the right party in America was three minutes.

At present the service is only available to America, but with the cooperation of the British postoffice it will be possible to telephone both ways within a very few months. The apparatus installed is expected to provide satisfactory communication at a distance of 1,600 miles out—about three days' voyage—but although commercial service is only offered the first three days, service calls were made with perfect success at 2,600 miles out.

The Bell Telephone Laboratories had engineers aboard the Leviathan since last July experimenting in overcoming the great difficulties, such as interference from dynamos and others.

For a long time the experimenters were baffled by strange crackings, which they finally discovered were caused by the rubbing of the metal joints of the ship's 300 stays, setting up a minute electrical current. The problem was overcome by bonding the stays over the joints with copper wire, as electric rails are bonded, and grounding them through the ocean.

Directional antenna is used, which gives better results and also makes for more privacy since a device for scrambling and then unscrambling a conversation to prevent listening-in is still unperfected.

As Inadequate as Electric Lights in only One Room

WHO would even consider having electric light in one room and oil lamps in the rest?

It's almost as bad with only one telephone in the house. If it rings when you're in some other room you have to drop whatever you're doing and rush to answer it. And at night—well, who wants to get out of a cosy bed and answer the telephone, even if the message is important? More telephones is the answer if you really want comfort and convenience.

Why not? The cost is so little—about the same as your evening paper. And the convenience? Well, have your extension telephones put in, use them for a few weeks, and then try to make up your mind that you can get along without them!

You'll find our Business Offices listed in the front of your directory. Just telephone the one that is nearest to you, and we will install as many extensions as you want, on short notice.

NEW YORK TELEPHONE COMPANY

Recent Advertisement Which Utilizes An Effective Comparison to Promote the Thought of More Telephones in the Homes.

Oklahoma Subsidiary of Kansas Company Changes Name.

The name of the Midland Telephone Co. of Oklahoma was recently changed to the Western Telephone Corp. of Okla. This company, which operates 16 exchanges, is the Oklahoma telephone operating branch of the Western, Power, Light & Power Co. of Salina, Kans., of which Nathan L. Jones is president and H. J. Clark, general manager. This holding company also has telephone operating companies in Missouri, Kansas and Texas.

Dog Acts as "Loud Ringing Gong" for Telephone Set.

When his dog "Tommy" points his nose toward the telephone and barks vigorously, David Irvine, jeweler and watchmaker, of Vancouver, B. C., Can., knows that he must answer the telephone. The story is told in Telephone Talk by P. McNeish, special inspector of installation of the British Columbia Telephone Co., Vancouver.

Being a little deaf, Mr. Irvine was unable to hear the telephone bell distinctly, so he solved his problem by teaching his dog to bark when the telephone bell rings. The faithful Tommy now keeps up his chorus of "bow wows" until he attracts his master's attention.

Tommy, by the way, holds a first prize from the Terminal City Kennel Club evening show, and Mr. Irvine says he wouldn't part with him for any sum.

A "Wonder Why" Regarding Hand-Made Iron-Wire Splices.

By N. E. Branson,

General Superintendent, Inter-County Telephone Co., Gallatin, Mo.

At times it seems we only creep,
While on our jobs we all but sleep,
And let important things go by,
Till we awake, then wonder why.

After reading some of the short articles in recent issues of Telephony by Ray Blain and others entitled, "I Wonder Why," and getting my subconscious mind into action—well, I just wonder why such important information contained in these articles has been dormant so long.

I wonder why so many Independent telephone companies—and by the way, some of them are very large ones—still continue to use the old hand-made wire joints in all open iron wire circuits when sleeves, through long and tried-out experience, have proved so satisfactory and cheap?

I wonder how many of these telephone companies have ever used the Wheatstone bridge on circuits made up with hand joints, and noted from time to time the resistance variations; or, after obtaining an approximate balance of the galvanometer in the bridge set, notice the needle swing, oscillate or breathe, so to speak, due to the varying resistance of these hand-made joints.

Yes, we can, and do, ring these old joints down with 90 to 100 volts of ringing current; but what about the feeble voice currents? And what is going to be our transmission loss? Yes, they work, but how well?

Now, if it has not been possible for us to solder all these open-wire hand-made joints, I wonder why we could not use an iron sleeve? First clean that portion of the wire where the joint is to be made, of all rust or corrosion, then slip the sleeve on and give it not less than three complete turns. After we have done that, what have we?

Here it is: A permanent connection, the strongest place in the wire, a neat job, high conductivity, satisfied patrons, and a job that has cost us less than three cents.

New York Association Selects Annual Convention Dates.

The Up-State Telephone Association of New York will hold its next annual convention at Rochester, on May 21, 22 and 23. The hotel for holding the meeting has not yet been selected.

are using

STROWGER AUTOMATIC TELEPHONES

Automatic Telephone Manufacturing Co., Ltd.
Strowger Works, Liverpool, England
ASSOCIATED COMPANY
International Automatic Telephone Co., Ltd., London

Nothing But The Best W
So Strowger Service

WHEN the Brazilian Telephone Company decided to modernize the system of the important and rapidly growing city of São Pa a thorough survey was made of the success with which various autom s had met in the larger cities throughout the world. Everywhere t r Automatic Dial operation was in use, the story was the same — that m met every need efficiently and economically, and with the highest s o telephone users.

As a result, the Brazilian Telephone Company ordered 5,000 l s equipment for Palmeiras office, São Paulo, which was cut into opera t year. So pleasing were the results, that 7,500 more lines were d installed for Central office. Now, 1,000 additional lines are being or Palmeiras office, and 2,500 more lines for Central office — evid e enthusiastic reception which has been accorded this equipment b e telephone company officials and the telephone using public of São Pa

Automatic Electric Inc.

Manufacturers of

STROWGER AUTOMATIC DIAL TELEPHONE AND SIGNALING SYSTEMS

Factory and General Offices: 1033 West Van Buren Street, Chicago, U. S. A.

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American Electric Company, Inc. . . . C
International Automatic Telephone Co., Ltd., L
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The New Antwerp Telephone and Electrical Works . . . . . A

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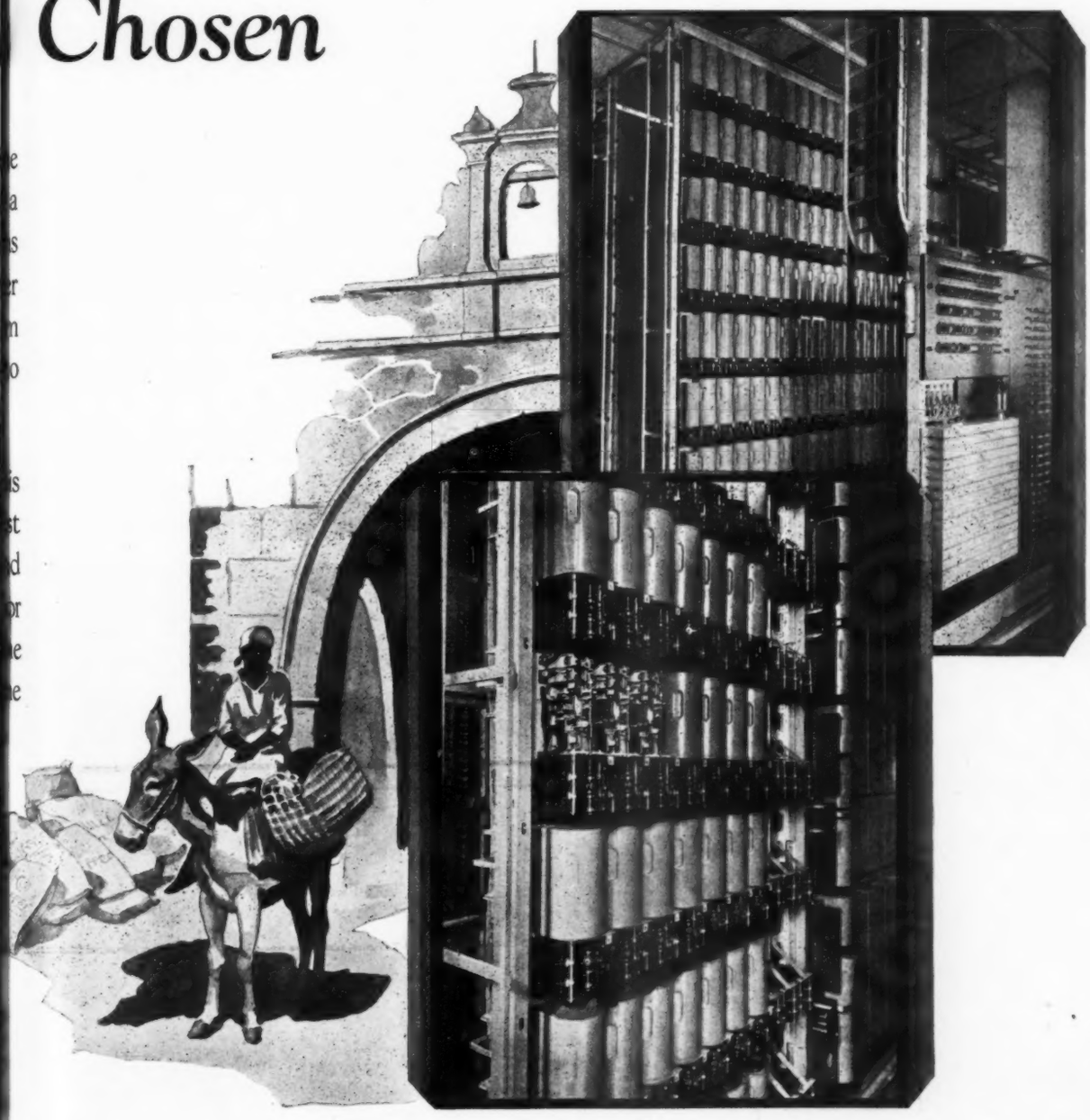
When writing to Automatic Electric Inc., please mention TELEPHONY.

Wd Suit São Paulo—
W Chosen



Two Views of the Strowger Automatic Dial Equipment in Palmeiras Office: São Paulo, Brazil

AUTOMATIC
SYSTEMS

When writing to Automatic Electric Inc., please mention TELEPHONY.

Testimonial Dinner to Frank H. Woods

President of Lincoln Telephone & Telegraph Co., Lincoln, Neb., Honored by Directors and Officers of Company at Dinner Attended by Prominent Nebraskans and Associates in Telephone Field on Completion of 25 Years of Service

Five hundred Nebraskans, including members of the supreme court, state and city officers, and business and professional men of high standing joined with the officers and directors of the Lincoln Telephone & Telegraph Co. in doing honor to Frank H. Woods, founder, and president of the corporation for 25 years, at a dinner at the Hotel Cornhusker in Lincoln December 11. Various speakers emphasized the part that Mr. Woods has played in developing the Independent telephone industry, nationally as well as locally, and paid tributes to his character and worth as a citizen.

At the tables were seated a number of men who had been linked with Mr. Woods in the national battle to establish the right of Independent capital to enter the field of telephone development and to cooperate with the great Bell system in furnishing that universal system which is the ideal of all men in the industry.

J. H. Agee, general manager of the Lincoln company, acted as toastmaster. He read letters of regret from Walter S. Gifford, president, and N. T. Guernsey, vice-president, of the American Telephone & Telegraph company; E. D. Nims, president of the Southwestern Bell company; Hunter L. Gary of the Gary company; W. B. T. Belt, president of the Northwestern Bell Telephone Co.; W. R. Dawes, Chicago banker; John H. Wright of the Jamestown Telephone Corp., Jamestown, N. Y.; General John J. Pershing and others.

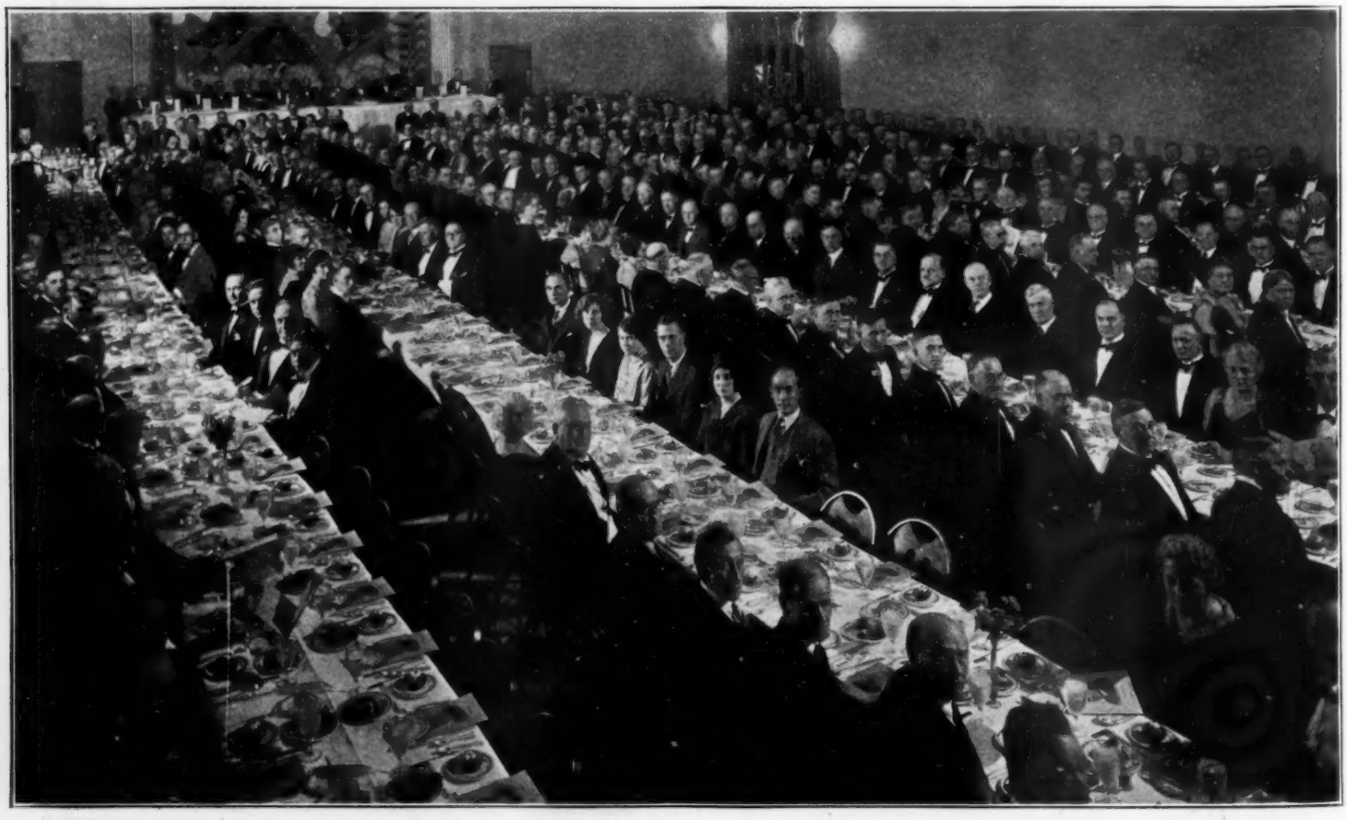
Among the telephone men in attendance were F. B. MacKinnon, Chicago, president of the United States Independent Telephone Associaion; Theodore Gary, Kansas City, head of the Gary companies; G. W. Robinson, president, and George K. Gann, vice-president of the Tri-State Telephone & Telegraph Co., of St. Paul; Lester Harris, president of the American Electric Co., Inc.; W. F. Benoist, president of Automatic Electric Inc., of Chicago; Grant Pelton, president, Telephone Bond & Share Co., Chicago; Guy Reed, vice-president of the Harris Trust Co., Chicago; E. C. Blomeyer, Wesley H. Loomis and L. E. Durham of the Gary companies, Kansas City; A. A. Lowman, vice-president, W. F. Cozad, general manager and Frank Randall, vice-president of the Northwestern Bell Telephone Co., Omaha.

A feature of the evening was a brief speech by Ambassador Charles Gates Dawes, a lifetime friend and business associate of the Woods brothers, made over the transatlantic circuit of the Bell company, from his mansion in London. Mr. Dawes stayed up until 2 o'clock in the morning in order to get the 9 o'clock evening connection at Lincoln. He warmly congratulated Mr. Woods upon his success, paid a tribute to his character and business ability, and suggested that when they were young men starting life as lawyers in Lincoln neither dreamed a day when, separated by thousands of miles with an ocean between, they would be able to talk with one another.

Mr. Dawes recalled old friends and associates gone, and expressed his regrets that Mr. Woods' father had not lived to be a witness to the testimonials given his successful son.

Governor Weaver was on the program, but sent his regrets as he had to fill a Chicago engagement.

Rev. B. F. Wyland, pastor of the Woods family church, delivered the invocation, and later in the evening the toastmaster read a letter from the clergyman congratulating the directors on their success in getting so modest a man as Mr. Woods in a cor-



General Picture of Banquet Hall at Testimonial Dinner to Frank H. Woods, President of the Lincoln Telephone & Telegraph Co. on December 11 in Lincoln, Neb. Over 500 Persons Aided Directors and Officers of the Company in Honoring Mr. Woods.

ner and compelling him to listen to what his friends really thought about him.

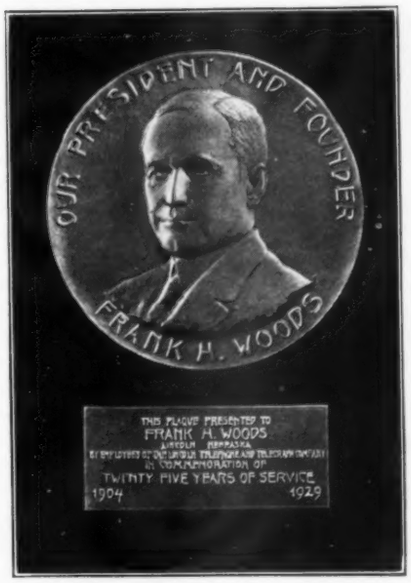
Leonard E. Hurtz, who was manager of the company for 15 years from 1906 on, said that when he took charge of the company there were 3,000 stations in Lincoln where today it has 23,000. He gave in anecdotal form a brief history of the struggles of the company, financially and with the strong Bell opposition in the city, and the many makeshifts necessary before the company had got rid of its many difficulties.

He said that no success could be achieved by any company or business without efficiency of organization, and that this was what Mr. Woods supplied. He had visions and ideals that he translated into reality, and met all of the definitions of what constitutes a great and good man. He sought to make of the Lincoln company an ideal corporation, operated only upon the lines of plain ordinary honesty and fair dealing, and he succeeded.

Theodore Gary told, in humorous vein, the details of the battle waged by the Independent forces of the country, first under his own and later under the leadership of Mr. Woods, of the difficulties in the way of accomplishing results, of the suspicions and fears in the ranks of the Independents while negotiations were on for a compromise with the Bell forces.

Mr. Woods and himself had later been associated in a number of business enterprises, and he paid a high tribute to him as a business man and executive. He said that he himself was not a lawyer, and that Mr. Woods' legal power enabled the Independents to get through Congress bills that made more certain the victory in their efforts to secure recognition as a factor in the field of telephone communication. Among these were anti-trust measures and the bill putting the telephone companies under the Interstate Commerce Commission, accomplished within six months after the movement was begun.

Frank D. Eager, president of the Lincoln Chamber of Commerce, said that Mr. Woods had, as a predecessor in that office, given much of his time and talent to getting worthwhile things done for Lincoln,



A Bronze Plaque on a Mahogany Mounting Was Presented to President Frank H. Woods of the Lincoln Telephone & Telegraph Co., Lincoln, Neb.

having then and at all times the welfare of the city and its people at heart. His company had always been a loyal supporter of the chamber of commerce, and its more important executives were members and workers. Its commercial engineer, Herbert F. McCulla, was first president of the junior chamber of commerce, and later and now is president of the national junior chamber.

Mr. Eager said that behind every successful business is a single high-powered man, possessed of directing genius, who guides his board of directors and his corporation to the heights. Mr. Woods' foresight has been no better illustrated than in his belief that the automatic type of equipment, that with which he equipped his first exchange, was destined to be the equipment of the future.

This was at a time when the telephone industry was at the crossroads, and it was Mr. Woods' vision that enabled him to choose the one along which the greatest development would be made. His courage and dauntless will carried his company over the early hills of difficulties, and justified his home city in claiming him as its first captain of industry.

Mr. Eager called the roll of Lincoln men who had achieved greatness in various walks of life, and said he believed Mr. Woods was entitled to a place upon it. He commended him as a man working without selfish purpose, and taking his pleasure in the work performed.

President F. B. MacKinnon of the national association said that he brought to Mr. Woods a message from the 7,000 Independent telephone companies of the country, congratulating him upon his achievements and joining with his other friends in doing him honor. He said that it had, in recent years, become a custom to bestow upon members a letter testifying to the meritorious and unusual character of their abilities, and he asked the privilege of bestowing one upon Mr. Woods as telephony's most useful player.

He said that he had attended some of the early conferences described by Mr. Gary, when the shaking of fists and threats of violence marred proceedings. But when the reins fell into his hands all of the fighting had been done, and there remained the task of utilizing the groundwork for the building up of a strong national organization, intent upon securing proper rates for good service and in the conserving of the rights secured. This has meant a great deal of work at Washington, and has involved many vexing problems.

When he first became president of the national organization Mr. MacKinnon went to Lincoln to consult with Mr. Woods, and he had kept up that habit in the years since then. Time and again he had advised with him, because he found him to be a man of good judgment and with the urge to act, and his advice and counsel had been freely given and profitably followed. The Lincoln company is looked upon by the industry at large as a model, an example of efficient and proper kind of management, and its success has been due more to the resourcefulness than the resources of Mr. Woods.

In his formal address of appreciation, Mr. Woods reviewed at length the strug-

The Group at Speakers' Table and Some of Out-of-State Guests at the Woods' Testimonial Dinner, Lincoln, Neb., on December 11

gle of the Independents with the Bell company in the years following the ending of the patent monopoly in the business, and told the story of how business sense triumphed in the end, and cooperation was substituted for a wasteful competition that cost the public as it did the companies. In his preface he insisted that, while he appreciated the warmth of the tributes paid him, he did not feel that he was deserving of them, and that the success of the company was due as much to the loyal and faithful work of officers, directors and employes.

Mr. Woods dwelt at some length on the situation with respect to the company. He said that the stockholders have never received and do not now receive a sufficient return on their investment, considering the risks of the utility business. After paying the modest dividends, there does not remain a margin sufficient to permit the company to experiment, and at the same time be large enough as a basis for the credit the company must maintain order to get the money needed for development.

Unlike the ordinary corporation the utility does not finance development and extensions out of profits, but must get the money from the public which is vastly more interested in that phase of work than in low rates. It was pointed out that the Lincoln company schedules are much lower than those of companies serving territory of like size, and below the schedule for Bell exchanges in Nebraska, fixed by federal court decree.

It has been possible to pay dividends only by reason of large and increasing toll revenues, since more than a third of the exchanges pay no return at all, and only 12 pay in excess of 6 per cent. Mr. Woods took strong ground in favor of appointment of regulatory commissioners, thus obtaining trained men who are not subject to removal because of political currents.

After the formal program, M. T. Caster, plant superintendent of the Lincoln company and the only man now on its roster who was there when it began operations, was called forward by Mr. Woods and presented with a watch for his faithful and efficient work. Mr. Caster began a groundman, but has always been a student, working himself up until he became chief, and the splendid condition of the physical property of the company, Mr. Woods said, was due to Mr. Caster and his faithfulness and ability.

No sooner had Mr. Woods finished, than L. B. Stiner, one of the directors, stepped forward and presented him, in turn, with a handsome timepiece from the directorate, accompanied by an appreciation of his treatment of his directors in their business contacts, his patience and kindliness, and the efficient way in which he had acted as its leader.

Mr. Woods had no more than finished giving expression to his appreciation, than General Manager Agee read a message of greeting from and signed by the 1,600 employes of the company, testifying to their appreciation of his attitude and treatment toward them and pledging him their continued allegiance.

As a further proof of their esteem Mr. Agee presented the surprise chief executive with a bronze plaque, attached to a mahogany board as a background, and containing a bust portrait of Mr. Woods, done by a famous eastern sculptor, Julio Kilenyi, who has executed similar work with Thomas A. Edison, President Coolidge, President Hoover, General Pershing and other eminent Americans, Mr. Woods was completely surprised but managed to stammer out some words of appreciation.

The dinner was held in the great banquet hall of the hotel, which was filled to capacity. Tables for out-of-town guests were ranged below the raised platform upon which was seated the speakers, while four long rows of seats furnished places for the diners. Great bouquets of flowers were used as table decorations. The women were given corsage bouquets of flowers, and each diner was presented with a replica of the bronze plaque, in miniature, the reverse side having raised pictures of the company's first and its present headquarters buildings.

Telephone Installed in Cathedral's Dome in Milan, Italy.

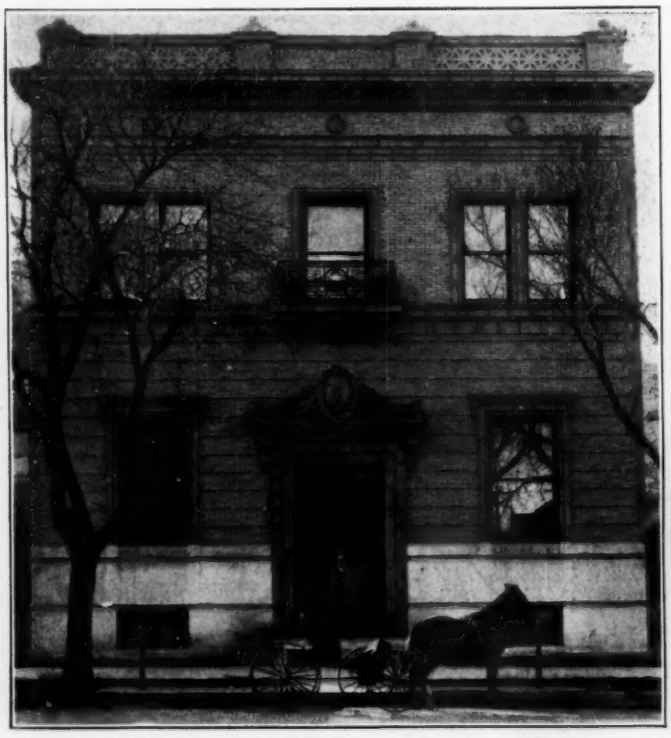
A public telephone was installed recently in the dome of the Milan Cathedral in Italy. It has been placed in the cathedral for the benefit of visitors who desired to order carriages to await them at the cathedral door.

Another development is a tremendous increase in the number of public telephones. Two years ago Milan had only 184 such telephones. Early this summer the number had increased to 802, and it was expected that it would be increased to nearly 2,000 before the end of the year.

These public telephones have been placed in every theater and picture palace in the city and in many other public or semi-public buildings.

Texas and Arkansas Associations Announce Convention Dates.

Telephone associations of two southern states recently announced the 1930 convention dates for their respective associations. The Arkansas Telephone Association will hold its annual meeting at the Gleason Hotel, Little Rock, on January 20 and 21, and the Texas Independent Telephone Association will hold its convention at the Texas Hotel, Fort Worth, on March 18, 19, 20 and 21.



First Building Erected and Occupied by Lincoln Telephone & Telegraph Co., Lincoln, Neb.—Present Headquarters of Lincoln Telephone & Telegraph Co. These Two Photographs Illustrate the Growth of the Company.

Twenty-Five Years in a Company's Life

Address at Testimonial Dinner in Honor of President's 25 Years of Service—Events in Life of Lincoln, Neb., Company and the Telephone Industry During the Years Which it Took for Cooperation to Be Substituted for Competition

Twenty-five years in the life of a man is an epoch. It spans the period that stretches between the preparation for life's task and accomplishment. Twenty-five years in the life of a corporation is but an episode. It is a stepping stone from work well done to heights of greater usefulness.

Few industries have made such strides in the last quarter century as the telephone industry to which for this period we have been devoted. This progress appears both in the technical developments which have made possible the high-grade service of today, and in the growth in popular favor of the companies furnishing this service.

Rapidly the exchanges of the country are being filled with marvels of molded metals that, endowed with almost human ingenuity, search for and complete connections without intervention of human hands with an accuracy as certain as it is uncanny.

In complement with these are the long, massed lines of wire that form the great state and national highways of communication, recently becoming international by new methods, new discoveries, new devices. The vision of universal service which engaged the minds of the industry's pioneers has been virtually realized.

But this realization has not come by the hand and mind of a single great organization as was at first conceived. The service was not extended in accord with demands for service. Competition entered, with far-reaching result in extension and development, but with serious effect in duplication of investment and separation of users.

Years passed before a fully serviceable and enduring character was given to the industry by the substitution of cooperation for competition. In those years, and in that work, the Lincoln Telephone & Telegraph Co. has had an active and important part. It came into being a quarter of a century ago because of the existence of a community need clamoring to be met.

In 1903 Lincoln had cast aside the habiliments of a primitive city; its people began to formulate its needs and to set about filling them. The founders of the company were impressed with the need for modern telephone service.

There were then in Lincoln only 1,500 of the old type, hand-ringing magneto telephones at rates which seemed very high. There were then in the entire state not to exceed 110,000 telephones in service and very few rural lines. Toll service was of a most limited character. The total number of telephones in the entire United States was two million.

Major patents, covering the manufacture of telephone apparatus, had expired and companies independent from the Bell system were springing up throughout the nation.

Capital to finance the original construction of our company was raised at home and in the building constructed on South 14th street north of M, 3,000 lines of automatic equipment were installed. This plant was cut into service 25 years ago with an initial list of 1,800 subscribers.

"Whatever Success We Have Achieved in the Direction of Our Efforts," Says Mr. Woods, "Is the Result of Those Yesterdays Which Have Been Busy, Interesting and Not Unhappy."

We had little realization of the astounding growth that was to be experienced, with its requirement for large amounts of additional capital to be added yearly; and the quantity of equipment placed at that time was thought to be ample to take care of the demands for service for many years to come. Nor did we realize a fact peculiar to the telephone business that the cost of service per telephone increases vastly with the size of the exchange.

The Bell company, operating here, was linked up with the so-called "vested" interests. It was the day of free passes and free service without public regulation, and the close cooperation and organization of those vested interests among themselves made competition with them most difficult.

Spurred into activity by the entrance of the new company in the field, the Bell company modernized its equipment and competed actively for public favor. The exchanges in Lincoln and throughout the country grew rapidly and as early as 1910 the whole country was fairly saturated with telephone service.

It was not competition; it was war, and very nearly war in the Sherman sense. Its engagements extended to a point where each contestant was undertaking to take business away from the other and thus to render valueless a portion of its property. No story of this conflict can be told which could possibly exaggerate the difficulties of the Independent companies in adjusting their rates and in acquiring new capital for expansion.

To compete with their great rival, the Independents found it necessary to furnish long distance service. The Bell company, as a weapon of self-preservation, refused connections to competing companies over its toll system. The Independents were forced to build long distance lines. In connection with one another we were then able to offer interconnection, poor as it was in those days when the possibilities of toll service were no better visualized by the operators than by their customers.

Contracts to secure the permanency of these connections were made between the Independent companies. Promptly the Bell companies, with determination and far superior resources, attempted to disrupt this system by the purchase of exchanges. It became apparent to the leaders in the Independent field that the battle in which they were engaged was not a local one, which had to be fought out on the banks of the Platte River in Nebraska or those of the Kaw in Kansas, but along a full national front.

By then the public was complaining of the burden of supporting competing exchanges. Business men were necessarily required to install both services, as were also residents who might desire a complete service and the ability to reach their full circle of friends who might in part be connected with one system and in part with the other.

Public regulation appeared in the form of commissions, and in 1909 the Nebraska State Railway Commission was created to regulate the rates and service of this state's utilities. Legislatures enacted laws requiring physical connections between competing exchanges, but neither court nor commission could enforce a law giving one company control of the facilities of an-

other. The situation continued to grow worse.

The National Independent Telephone Association charged the Bell companies with violation of the Sherman act and other anti-trust laws in an attempt to establish a monopoly. We argued that its effort to purchase the integral parts of the Independent system was an unlawful attempt to destroy its competitors.

Mr. Gary has told you something of this great struggle which truly threatened the entire industry with financial ruin. In 1909 the Bell system had purchased a large and important telephone system operating in Ohio, and it soon became too hot for them to hold it, and in consequence they turned it over to J. P. Morgan & Co.

After the filing of a number of anti-trust suits in this instance, Mr. Davison, of Morgan & Co., arranged a conference between Theodore N. Vail, president of the American Telephone & Telegraph Co., and myself as president of the National Independent Telephone Association, with a view toward the development of a plan for the protection of telephone investments, the supply of universal service demanded by the public, and the stabilization of the whole telephone situation.

Acceptable Plan Adopted.

The history of the conferences which ensued, if written, would make interesting reading. Repeatedly the negotiations seemed doomed to end in failure. Finally the committee of seven represented the Independent field, of which our honored guest, Mr. Gary, was a member and its secretary, succeeded in developing a plan acceptable to both the Morgan and Bell interests and later adopted by the Independent association.

This accomplishment was most constructive and its far-reaching influence has resulted in the conservation of all honest telephone investments, and in furnishing to the people of the United States the world's finest telephone service, subject to the regulation of state and national commissions.

Pursuant to this plan, the Lincoln company purchased the property operated by its competitor in Nebraska south of the Platte River, and from the west boundary of Adams and Webster Counties east to the Missouri River. In return, it sold to the Bell company its properties outside of that area, and the systems and exchanges in both areas were consolidated with the elimination of dual service and all its detriments and dangers to the service and the operating companies.

The history of this company since that time is familiar. We now have a plant costing more than $12,000,000, with 134 exchanges, with more than 84,000 owned telephones in service, and with long distance service extended to more than 100,000 stations serving a population of more than 500,000 people by the Independent telephone companies in our territory. By contractural relations we constitute a distinct unit in the great telephone system of the United States. With our Independent connecting companies we furnish the exclusive service in our territory.

This company has the rare distinction of being the only Independent company in the United States that furnishes all of the toll service within its territorial limits. Ours is the only territory in which, so far as I know, the Bell system has ever sold its trunk toll lines.

Early Use of Automatic.

Our company has played a prominent part in the development and use of automatic telephone service. We were one of the pioneers in the adoption of this apparatus in our Lincoln exchange. Subjected to the ridicule of our competitors, we were told that the company was doomed to failure because of our action in this regard.

We have lived to see the day when we sold to the Bell company a license to manufacture automatic telephone equipment made under our patents, and to see our system adopted as the standard, not only throughout the greater portion of the United States, but also in England, Germany, Japan, and all of the principal telephone-using nations of the world.

The Lincoln Telephone & Telegraph Co. was forced to finance itself by the sale of its securities to its patrons and users. The thousands of stockholders who have purchased its stock have been a great source of strength to the company. Today all of the great utilities of the country have adopted this as the best means of financing; "Customer Ownership" is now the slogan of all the utility companies, and their efforts are directed toward the distribution of securities in the territory served. Success is attending their efforts.

Circumstances made us pioneers along this line. We take pride that our methods and policies have become the established practices of all the leading companies.

Things Important to Public.

The telephone-using public is vitally interested in three important things:

First, good, accurate, and prompt service,

Second, reasonable rates for service, and

Third, the ability of the company supplying the service to care for its ever-increasing demands.

Only a successful company can supply these needs. Only a prosperous company can be successful. There has been an erroneous impression that when the utilities prosper they do so at the expense of the public. Nothing could be farther from the truth. When the utilities prosper, they cannot prosper at the expense of the public; but when they fail, they always fail at the public's expense.

When a utility fails, its stockholders may perhaps suffer inconvenience or hardship. They usually can stand it. Lack of prosperity may reach a point affecting the employes but they too survive; but the public, in failing to be served, always suffers. An entirely different measure is used to discover whether a utility is prosperous than is used to discover whether an industrial concern is prosperous.

We say an industrial concern is prosperous when in prosperous times it has been able to make large profits beyond immediate needs to care for it during the lean years and to put back into the business itself for development. Practically the entire growth of a prosperous industrial concern comes from the excess profits of the business itself. A utility is not at all like that.

All that it ever expects to get, or that it is entitled to have—all that it ever asks to get—is money enough to pay its bills; to pay fair reasonable wages to the men and women rendering the service; fair reasonable wages for the capital making the service possible; and one thing more, a most important thing, a reasonable margin over and above that every year. Not a profit as the word is interpreted in business and in commerce, not a cent to put back into the business, nothing for development, not a big margin at all, but a margin that will give a sufficient cushion of safety to maintain beyond question the credit of the utility, and that invariably every year, because the credit need is constant—that is all it requires and all it asks.

"Margin of Safety" Explained.

Let me illustrate what this margin really is. The Lincoln Telephone & Telegraph Co. is a reasonably prosperous utility. In the 12 months' period last year, if the revenue of this company had averaged one-tenth of one cent less per day for each telephone in service, there would have been no margin or surplus whatever and the dividends could have been paid only in part. That is the measure of that margin.

Need any one be disturbed about its size?

The only disturbing thing about its size is that it is so small that no experimenting can be done with it if continued, dependable, and increased service is to be had, and at least a comparable margin must be maintained.

The relationship between the public and the utilities in the matter of rates is not a horse trade or a case for jockeying to give to the one or the other an apparent temporary advantage. This relationship is a permanent living basis upon which they must continue to work together indefinitely for the benefit of each.

Not a single dollar from rates paid by the public is or has been used in the promotion, establishment, or construction of the property. In our early days we were subjected to bitter attack because a small amount of stock was issued for promotion purposes.

Although the amount of outstanding securities never has had anything to do with the determination of rates for service, it was long ago that this so-called "watered"

stock was dehydrated, certificates for promotion stock were actually cancelled, and every dollar of outstanding stock today is represented by a dollar of investment. Promoters and officials of the company have not profited in its development except by the receipt of dividends on actual investment to the same extent as other stockholders.

The company's financing has been secured at nominal cost; the rates paid for money have fortunately been the very lowest. The average rate to capital invested is only 6 per cent. The average earnings on our plant value is only 5¼ per cent. Plant values have not been written up in conformity with the current trends of cost for labor and materials entering the structure. The basis upon which rates have been asked has always been the actual cost of the property, so much of which has been acquired and constructed at costs far below those of today.

But costs for service are increasing along with the demands for service. Since 1904 the population of the United States has increased approximately 45 per cent. It might be natural to expect that telephone service during that period would increase in that proportion, but since that date it has increased more than 1,000 per cent, or ten-fold.

This additional service cannot be rendered by simply getting more people to do the work. If it could, that would be easy. We must have more people but before they can be used, we must have more tools and appliances and facilities with which they can work. This is one of the least understood and most misunderstood problems by the public in the whole utility business; this matter of the continued demand for more and better and different service that the public creates and we have to meet, if we can.

With our telephone business in this prairie country without large centers, before an additional employe can be taken on, $8,200 must be put out before he can have the necessary facilities with which to work. To state it more precisely, the average investment plant per employe is $8,200.

For next year our business will require gross expenditures of more than $2,000,000 to meet the requirements for service for which there is already demand. These additional amounts do not go in for the purpose of making more money for those who have already invested. If they are now allowed a fair return, they cannot hope to get more. Neither does this additional investment increase the value of the property already in service; it is simply to care for increasing demands.

When these large additions of capital are required, it is very important that they be met; much more important to the public than to the companies. Ability to get these additions of capital depends upon the credit of the company, and that credit in turn depends upon that margin we spoke of. That thin narrow margin is the difference between credit and no credit. I am not speaking of bonded capital. Any one can put all he possesses in the pawnshop—then he is through. I am talking about the credit that will bring money into the foundation of the financial structure with the investor a partner in the equity.

It is only by protecting the credit of the company today that service for tomorrow can be insured. The protection of this margin means the protection of the company's revenues.

The only error that the companies themselves, or the commissions regulating them, can make in the matter of rates, is to make them too low. Rates that are too high are at most only slightly too high; the amount they might be reduced is negligible and the remedy of reduction is always available.

The damage that may be done by rates that are too low, by destroying this margin, is stupendous compared with any trifling apparent saving to users by reducing rates. No remedy is available when insufficient rates have failed to provide that vital margin.

This company operates a total of 134 exchanges of which only 12 serve 1,000 or more telephone stations. Of this entire number only six in the year 1928 showed earnings in excess of 6 per cent and 72 showed no return on investment at all. Of its 84,000 telephone stations, 28 per cent serve farmers, and it is fully known that rural telephone service is sold for far less than it costs. A sympathy and appreciation for the present situation in agriculture has led us to be slow in making a fair and reasonable adjustment which can not be long postponed.

The company's rates generally are the lowest in existence, when compared with any company giving comprehensive service in a large territory. With the aid of our toll service, in the face of constantly-decreasing toll charges, we have been able to pay a remarkably low interest charge and dividends at a modest rate. The remaining surplus has been pitiably small. The margin we have been permitted to earn is far less than it should be and less than it may be expected to be.

There are hazards in utility investment that must be taken into account. The automobile has put street car companies practically out of business. Those securities, once so attractive, have greatly depreciated. Utility investment is always accompanied by a risk which must find recognition in a return of earnings.

The duty of the telephone company is three-fold—to its stockholders, to its employes, and to the public.

To its stockholders: to pay a fair, reasonable wage for the funds invested in the business, taking into account its risks and the competition for funds of all other business enterprises.

To its employes: to pay fair, reasonable wages that they may live under conditions allowing them and their families to reach the recognized standards of American citizens, to allow them to remain reasonably free from the attractions of competitive employment and remain in the business for periods which will allow for their full development and usefulness.

And to the public: in furnishing service which is accurate, prompt, dependable and extensive at the lowest possible rate consistent with these other considerations.

We have attempted to fully recognize and live up to this duty; and if there has been negligence on our part, it has been involuntary except as to the stockholders alone.

It has at times been said that this company has never had an application denied before the rate regulating body. So far as this is true, it is because this company has never asked for rates to which it was not more than justly entitled.

We might have gone, as our former competitor did a few years since, into a federal court and enjoined the commission from interfering with the collection of a fair schedule of rates which we would have been able to sustain with ample proof. Rates thus established by the Bell company in other parts of Nebraska are much in excess of rates charged by this company, and yet are rates which are only reasonable and fair, as was determined and sustained by the court's review.

We have pursued a plan of working pleasantly and agreeably with the commission but have found it very tardy in according us rates to which we are entitled. In its work the commission has been harassed and maligned by the occasional outbursts of an uninformed public which now and then find reflection in the comment of local newspapers.

Public regulation came to the utilities in a spirit of retaliation. Some of the utilities were doing things to which the public had just objection, and it is said, "Let's regulate them." No one likes retaliation,

Room at the Top.

The supply of those who know how to do things capably under supervision and under the spur of insistent leadership is quite ample. For this reason I have found that the most reliable test of whether a man is competent to rise to high industrial command can be summed up in a phrase—the man who says, "What else can I do?" is the man destined to business leadership.

Industrial leaders know how rare these men are, and no matter how far down the line they begin to disclose themselves, their rise is absolutely certain. When this kind of a man appears, nearly every other consideration is secondary.—Albert R. Erskine, president, Studebaker Corp.

and at first the utilities were naturally vexed. They disliked to be taken by the neck and told not to do something or get "spanked." No child enjoys that, and the utilities were children then and the public an inexperienced parent.

Time has changed this attitude in both directions, and honest, intelligent regulation has been helpful to the utilities and the public alike. We believe in it, and we further believe that its greatest usefulness is yet to be realized.

As constituted in Nebraska, tremendous burdens of effort and responsibility are placed upon its railway commissioners who are responsible for this work. The public and the utilities in this state have been fortunate in the selection of its commissioners. The requirements for this service in training, experience, integrity, and foresight are very high, and we are to be congratulated that in the political selection of this board, whose powers for permanent good or detriment are so broad, we have fared so well.

Notwithstanding this good fortune thus far, our experience has introduced us to the dangers of the present method of selection and points toward a change which we believe to be in the way of definite and permanent public interest.

The utility commissioners of Nebraska should be selected for their particular fitness for this important post. They should be appointed by the governor, and confirmed by the senate, for the period of their useful lives, and of course with the usual provisions for removal upon just cause. The practice of the federal government in the selection of its judiciary and the members of its Interstate Commerce Commission should be here adopted. Removal from political influence, and the necessity of periodic expenditures of time and money for re-election, together with the certain opportunity for long experience, would place this commission in position to accomplish continuously better results.

We have not received and are not now receiving a reasonable return and our stockholders have not been compensated as they deserve to be compensated. In making telephone investments, they alone take the risk. The state in making rates does not guarantee that they will give anequate return. Time and again the courts have sustained rates for service which allow utilities to pay 9 per cent upon their stock even though this figure would be much less if computed on plant value.

But it is not our desire to expose our troubles at this dinner in celebration of our 25th anniversary. We mean to make no complaint but are hoping for better things in the future. These things, however, are uppermost in our mind; and agreeable to our policy of informing the public of the facts and necessities of the business, we want it to know that it has been saved hundreds of thousands of dollars in telephone charges which we should have been justly and reasonably entitled to collect.

As this is not an improper occasion for sentiment, we reflect that in our 46 years of personal residence in Lincoln, and in the 25 years of conduct of affairs of this company, we have been more concerned with our reputation and standing as a citizen, and of the institution which we represented than in profits in the common sense of that term. The directors of this company at all times have striven to make it a model public utility fair alike to its organization, to its stockholders, and to the public served.

Today is not only the child of yesterday, but is also the parent of tomorrow. Whatever success we have achieved in the direction of our efforts is the result of those yesterdays which have been busy, interesting, and not unhappy. I pledge you it is our purpose to continue along those same lines of effort in the days to come.

Definite Policy on Communications Urged

David Sarnoff, Executive Vice-President of Radio Corp. of America, Advocates Policy to Govern Communications and Regulations Which Will Not Hamper Industry, in Statement Before Senate Committee Investigating Communications

In placing myself at the service of your committee, I request the opportunity to make a statement of the interests of the Radio Corp. of America in fields directly or indirectly concerned with radio development. I do this because the position of the company, both in the art and in the radio industry, cannot be adequately measured without a brief historical background.

To those not intimately familiar with the development and progress of radio communications during the past 10 years, it may not be clear why radio, initially established for ship-to-shore wireless communication, and subsequently spanning the ocean with a new system of international communications, should have reached out to the home, to the motion picture studio, to theaters, to the phonograph industry, and to other industries and arts.

It may not be clear why an organization which undertook the task of developing ship-to-shore and transoceanic wireless communication should have extended its activities as widely as has the Radio Corp. of America.

The reasons for the organization and establishment of the Radio Corp. of America are now matters of record. The great technical contributions made by the nation's leading electrical laboratories, spurred by the necessities of international communication, resulted in the creation of the first wholly practicable and continuous system of transoceanic wireless communications. That was in 1919. The system was the fruit of American inventive genius, and gave our country an independent position in world communications.

The mobilization of patent rights and research, engineering and production facilities, was a financial and industrial task fraught with the greatest difficulties. This task was undertaken by the chairman of the board of the Radio Corp. of America, Owen D. Young, whose vision and organizing genius liberated a new art from patent restraints and opened the doors for the development of a new and important American industry.

Any consideration of the radio art discloses the extraordinary complexities of the problem that developed with the establishment of the first completely-owned and created American system of transoceanic radio communications. The signal radiated from a transmitting station has no limits in space. It spans the continents. It ties ship to shore with wireless communication. It enters every home. Even if we would, the grasp and reach of the new art could not be restricted to a specified field.

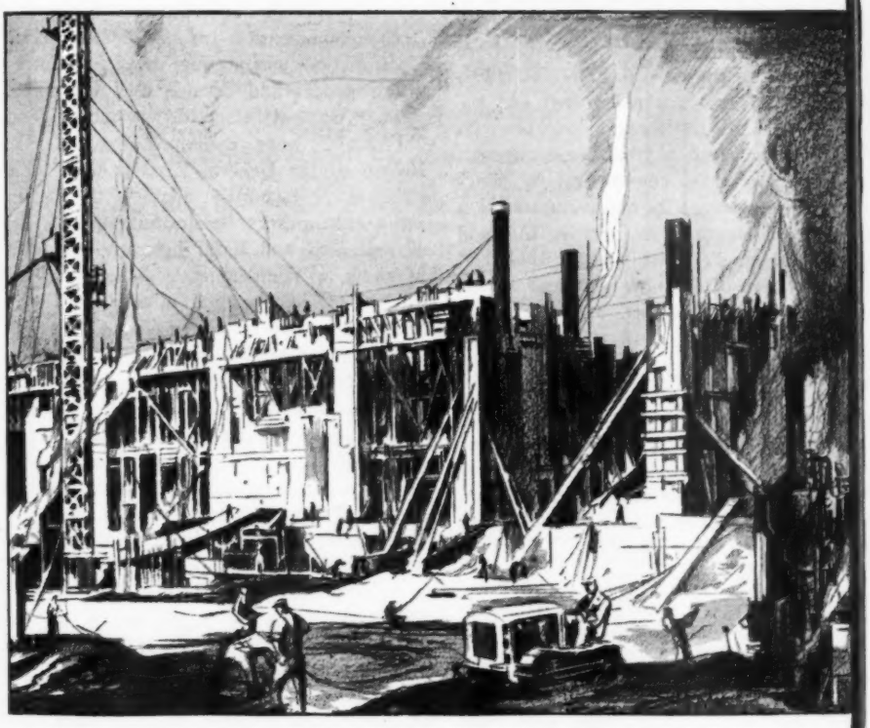
It soon became clear, therefore, that in point of technique, the same principles that had evolved a practicable system of international communications could also be applied to radio communication to the home. A new industry, a new field for American investment and enterprise, awaited the establishment of a radio service to the home.

In the latter part of 1920, electric interests associated with the Radio Corp. of America demonstrated that a program of entertainment, education and information could be regularly broadcast to the home by radio. Immediately the new service that had been developed for the radio art called for the creation of a vast new industry.

Broadcasting Service for Homes.

Again the part played in this respect by the Radio Corp. of America is a matter of record. The development of a manufacturing industry to serve the newly-created broadcasting era required the solution of many intricate technical problems. The investment of many millions of dollars, the creation of a nation-wide broadcasting service through the National Broadcasting Co., and the further mobilization of pat-

More *and still more* telephones for tomorrow



Your voice starts new factories a-building

Day by day, the telephone becomes a more significant factor in social and business intercourse. As a means of communication on land and across the ocean, its use grows steadily and it is soon destined to become an accepted adjunct to travel in the air.

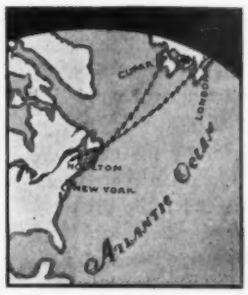
More and more equipment will be needed—telephones by the million, copper wire by the millions of miles, parts and accessories ranging from delicate springs to giant reels of cable, from the simple transmitter mouthpiece to the highly complex telephone switchboard.

To meet this program of expansion Western Electric's manufacturing facilities are being doubled. Huge additions to plants at Chicago and at Kearny, N. J.—a new factory at Baltimore—all this is evidence that however great the demand for telephones in 1930 or 1940, that demand will be satisfied.

In homes

In offices

In airplanes



Across the ocean

This busy scene is typical of Western Electric growth at Baltimore, Chicago and Kearny, N. J. It is growth made necessary to provide telephone apparatus whenever and wherever needed.

Western Electric

MAKERS OF YOUR TELEPHONE

ents, processes and manufacturing equipment, were the contributions made to a pioneer industry by the radio corporation.

Such mobilization was imperative in the interest of an advancing art, for radio, it must be understood, is not a single invention, method or process. It is the sum of the invention contributed by many factors and in many countries. The development of the radio tube, for example, the very heart of the modern radio set, required over 30 separate and distinct patents. Superheterodyne receiving sets involved 100 such patents, and a single broadcast transmitting station utilizes over 100 distinct and supplementary patents.

Whether such patent ownership or control by the pioneering factor in the field of radio communications in the United States has served to restrain or create a new industry, whether it has served to limit or expand competition, whether it has restricted or enlarged public service, are questions of fact, not of theory.

The best available statistics of the industry to January 1, 1929, show that in 1921 the retail value of receiving equipment sold in the United States was barely $5,000,000. By the end of 1928, the total for the industry had reached $650,000,000. Eight years ago the radio audience of this country comprised 75,000 people. At the beginning of this year our nation-wide radio audience had grown approximately to 40,000,000 men, women, and children.

Cooperation Given Other Industries.

The principle of association, rather than destructive competition, which radio has developed with other arts and industries, perhaps is well illustrated in its association with the phonograph industry of the country. Competition to the death could have had but one result: The destruction of an older, established industry, of a great capital and property investment, and the resultant unemployment that inevitably would have followed such a course, not to mention the destruction of a service of recorded music and speech which the phonograph industry had built up during its many years of development.

Radio's association with the phonograph industry, on the other hand, has resulted in the progress of both industries, the protection of capital investment, and the creation of new services in the entertainment and educational field through the combined facilities thus established.

The latest development of the radio art has been in the field of motion picture entertainment. Electrical and radio progress have made possible the synchronization of sight and sound on the same film. A new technical development had come to revivify an industry that had reached its zenith in the presentation of the silent drama.

Once more the problem posed before the radio and electrical factors was association with the entertainment industry, or the practical abandonment of many years of research and technical investment in this phase of the art.

Radio chose association with motion picture and theater interests, and the results already are apparent. The talking motion picture has tremendously expanded the opportunities of the mechanical entertainment arts. It has meant prosperity instead of decadence for the motion picture industry, and it has opened a vast new field for visual and aural education, which will be developed with the further progress of the radio and electrical arts.

Television Service Being Considered.

I have tried to sketch briefly the progress of the radio art from the ship-to-shore communication that it was first visioned to be; its extension to a recognized and reliable system of transoceanic wireless; its inevitable progress to the home through the system of mass communication inherent in broadcasting; its natural association with the phonograph industry in the field of sound recording and reproduction, and the adaptation of the new electrical instrumentalities thus developed to the creation of the new industry of talking motion pictures.

The radio art is now at the cross roads of a new and perhaps greater development. Television, or sight broadcasting, is beckoning to the industry. Again a new series of vastly complicated scientific, technical, industrial and service problems arise for solution in the radio industry.

New channels of transmission must be provided in the air. Improved instrumentalities of transmission and reception must be created for the art. New services of entertainment and education must be established for this purpose.

At a time when the nation calls for industrial initiative, when our government is properly using every effort to quicken and develop private enterprise, when large capital investment requires encouragement and security, and when a new art is knocking at our doors, an open road for radio development would help to maintain public confidence in the radio industry.

Onerous legislation that would place the radio art in a straight-jacket, isolate it from fields and activities with which it has a natural kinship, and restrict its service possibilities, would retard the advance of the radio industry at the most vital moment of its development and defeat the very purpose which your committee is trying to accomplish.

Approves Communications Commission.

I am in full accord with what I understand to be the primary purpose of the bill now before your committee, to provide for the creation of a governmental commission on communications, which would regulate, insofar as is practicable, radio and all other communication services. I agree with the principle that the assignment of wave lengths should be within the regulatory powers of such a commission; and I am sympathetic with such general provisions of the measure as would promote, and not restrict, the progress of the communication arts.

Developments in Materials Used in the Communication Feld.

Some 250 engineers affiliated with the New York section of the American Institute of Electrical Engineers at a meeting last month, heard four speakers describe some of the recent developments in the materials used in the apparatus of the communication field. This meeting, the first of the year held under the recently organized communication group of the New York section, was productive of four interesting papers and considerable discussion.

The unusual electrical properties of "Mycalex" were explained by W. W. Brown of the General Electric Co. This material is especially adapted to use in radio transmitters because of its low dielectric loss and high dielectric strength. Mycalex, a moulded material, is composed of 60 per cent ground mica and 40 per cent lead borate heated to 675° Centigrade and then compressed under a pressure of 10,000 lbs. per sq. in.

It is so hard that machining can only be accomplished by the use of tungsten-carbide alloy tools and carborundum wheels. Mycalex is highly resistant to arcing. A continued arc only produces a path of fused lead borate, which resembles glass and can be easily scraped off.

Another talk on the copper oxide rectifier was given by J. R. Smith of the Westinghouse Electric & Mfg. Co. He pointed out that the effectiveness of the unit as a rectifier depended on the low resistance for currents flowing from the cuprous oxide to the copper plate and the vastly higher resistance to currents in the reverse direction.

W. Fondiller of the Bell Telephone Laboratories described several of the new applications of material in the telephone field —the use of phenol fiber in the selecting mechanisms of machine switching. It was stated that the addition of 3 per cent of lead to brass contacting strips has increased their life four-fold, through its lubricating action.

Duralumin is now used in minute strips in the electrically-controlled light valve, permalloy in telephone cables, and perminvar for purposes involving low magnetizing forces.

Some of the improvements now in use in the manufacture of telephone apparatus were outlined by D. Levinger of the Western Electric Co., who illustrated his talk with motion pictures. The vastly increased speed of manufacture of telephone ringer covers through casting them from phenol plastic compounds rather than fabrication of metal, the use of cellulose acetate for protection of windings against moisture, and the manufacture of permalloy rings for loading coils were very interesting.

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Hearings on Federal Communications Bill

Senate Interstate Commerce Committee Takes Testimony and Questions Officials of Radio Corp. of America—All Favor Merger of Wires, Cable and Radio—Highlights of Testimony and Questions—Interesting Phases of Communications

Establishment of a definite policy by the United States to govern its communications so that the industry will know "where it stands" was urged before the Senate committee on interstate commerce December 12 by David Sarnoff, executive vice-president of the Radio Corp. of America.

What Radio Officials Uurge.

Declaring that foreign governments have established policies as to their communications, Mr. Sarnoff said that the United States has never definitely decided between the elements of public or private operation of its international communications. There is a "golden opportunity" for Congress at this time to decide this vital issue, he said.

Creation of a department of communications, presided over by members of the cabinet, rather than of a federal commission on communications, was recommended before the committee on December 13 by Maj. Gen. James G. Harbord, retired, president of the Radio Corp. of America.

General Harbord said he was opposed to the commission form of regulation. The United States, he declared, might very well follow the practice of other countries in setting up a ministry of communications. He endorsed the essential purposes of the Couzens bill (S. 6), now before the committee, to centralize the control of wire and wireless services.

General Harbord followed on the stand David Sarnoff, executive vice-president of the Radio corporation, who completed his testimony begun on December 12. Mr. Sarnoff, under examination of committee members, discussed in detail the cross-licensing agreements maintained by his company with radio receiving set manufacturers for which a 7½ per cent royalty is assessed.

Mr. Sarnoff, in a formal opening statement on December 12, published on other pages of this issue, advised against "onerous legislation that would place the radio act in a strait-jacket, isolate it from fields and activities with which it has a natural kinship."

An Economic Problem.

Questioned by Senator Wheeler of Montana, Mr. Sarnoff said the communications problem of the Radio corporation is an economic one. The proposed I. T. & T. RCA merger would be an "economic step in advance," he said.

Senator Dill of Washington asked whether the technical development of radio communications would not be retarded through such a merger.

The I. T. & T. Co. with its expensive cables would make radio its secondary means of communication, he said. The Radio corporation, he said, has been instrumental in radio development because it has been found to compete with the cables.

"The radio communication business of the Radio corporation is not the kind of business that justifies intensive research," said Mr. Sarnoff. The gross return from its transoceanic communication amounts to $5,000,000 annually, he said, of which the net income is $1,500,000.

The corporation, he asserted, is handicapped by lack of a domestic "pick-up and deliver" or messenger service. These services, maintained on extensive scales by the Western Union and the Postal (a part of the I. T. & T. system) afford them a great advantage over the Radio corporation.

Describing delivery services as a "fundamental necessity of national and international communications," Mr. Sarnoff said the Western Union has 26,000 offices throughout the country and the Postal about 6,000.

Radio's Effect on Communications.

Radio has had a serious effect upon cables in international communication, he said. To lay a cable across the Pacific, he declared, would entail an expenditure of about $20,000,000, while a transpacific radio circuit would involve only about $1,000,000.

"I expect to see development in transpacific radio communication that will not only speed up service, but reduce rates. No new cable could be justified at the present time," he stated.

Mr. Sarnoff declared that facsimile transmission by radio, or the movement of photographs by radio, will be used predominantly, and will largely supplant present "code" methods. At the present time the Radio corporation maintains a transatlantic radio-photo transmission service, but not in the United States.

Asked by Senator Brookhart (Rep.), of Iowa, about his views on government ownership, he said he concurred entirely with the views expressed by Mr. Young. He said that the external communication situation represents a choice "between two evils," competition and government ownership, if it should be found that a private monopoly is not feasible.

"As between the two evils, I prefer government ownership to competition," he declared.

He favored a fusion of the domestic units of the Western Union and I. T. & T. "on economic grounds" only, to eliminate duplication, provide more efficient service and reduce rates. But in the international field, he said, it is a question of national defense and foreign trade, as well as economic factors.

Mr. Sarnoff then advocated the establishment of a definite communications policy by the United States.

A Golden Opportunity.

"There is a golden opportunity before this committee to establish a communications policy," he said. "This government has no communications policy. In European countries, a sort of foreign office policy relating to international communications has been adopted. It is especially important."

He declared he wished to advocate not only enactment of the bill for creation of a communications commission, but also the establishment of a definite communications policy. The country and the industry, he said, have the right to know whether the government intends to foster a competitive policy or a monopoly, and whether it will be private or governmental.

"Interference" with the Radio corporation by governmental activities was criticized by the witness.

"There is a considerable amount of interference with our organization," he declared. "We are constantly being charged with monopoly, particularly in the last five years."

The Federal Trade Commission investigation of charges of monopoly lodged against the corporation lasted for five years, Mr. Sarnoff said, "after which we were told nothing was the matter." Congressional committees also have attacked the question of exclusive foreign communications contracts made by it.

"This interference from Congress has not been from the passage of laws," he stated, "but from the criticisms which I have recited."

Congressional inquiries of this character have had an "effect" upon the Federal Radio Commission in its allocation of channels for communications, he continued. Radio corporation applications, he said, have been considered on a basis "as if it was started only yesterday" and past service in the radio field "has meant nothing."

The Proposed Merger.

Mr. Sarnoff, in resuming his testimony on December 13, read a statement explaining the proposed merger of the Radio corporation's communications services with the I. T. & T. Co. Under examination by Senator Dill, of Washington, he said the I. T. & T. at this time "is infringing patents of the RCA." No suits have been

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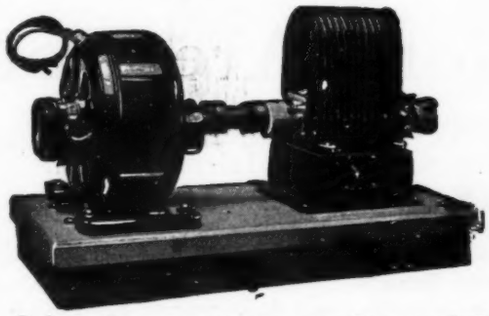

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brought, however, he said, "because of the contemplated merger with the I. T. & T."

Declaring the royalty assessment is held to be "fair and equitable," Mr. Sarnoff said that the figure was agreed upon at the beginning of the practice, and that it is still thought to be equitable. He said, replying to Senator Dill, that cross-licensing contracts are held with 38 receiving set manufacturers, who are the leading producers in the field.

Although there is no definite policy as to the licensing of manufacturers, he said, the practice is not to license any additional ones, because there "already is over-production in the industry, and we don't want to extend the licenses any more." On the whole, he said, the industry "is in fairly good condition," describing indebtedness of certain of its licensees for payment of back royalties. The total amount of royalties due, he declared, is $565,621.

General Harbord on December 13 read a prepared statement to the committee, after which he was questioned on various points. The statement will be published in next week's issue of TELEPHONY.

The chairman of the committee, Senator Couzens, of Michigan, called attention to speeches and articles by General Harbord, condemning the commission form of regulation.

"These imply," he observed, "that the General does not have the highest regard for the civil end of the government."

General Harbord disagreed with this interpretation, saying he is opposed only to some of the methods of civil regulation.

As a "workable suggestion," General James G. Harboard on December 14 recommended that:

"In the field of international communications, regulations, rates, classifications and operating practices shall be governed by international conventions or arrangements to which the United States is or may become a party; or, in the absence of such conventions or arrangements, by agreements made between operating agencies concerned, subject to the approval of such regulating authority as may be created by law."

This "considered recommendation" General Harbord offered to the committee in response to a question put by Chairman Couzens at the conclusion of the hearing the previous day as to the General's views concerning ways and means of regulating rates on international communications.

"The difficulty of regulation in the international field, due to the fact that various sovereign states may be involved, is quite apparent, and points unmistakably, in my opinion, to negotiations as the only method by which rates, operating practices, etc., can be fixed, consistent with national pride where the ends of either radio or cable circuits are owned in different countries.

"My own feeling is that this could be best accomplished by an executive branch of the government, but the instrumentality is, after all, a matter of detail when the principle of regulation has been accepted."

A lively discussion was precipitated when Senator Brookhart proceeded to go into the matter of traffic and interest rates, and demanded to know what General Harbord considered a fair rate of return on the capital investment of the Radio corporation.

Senator Barkley inquired if General Harbord did not think a monopoly even under government regulation might reach a point where it could regulate the government instead of being regulated by it. General Harbord replied that he did not think there was much danger of that.

"Well, many honest people think that public utilities sometimes get so powerful that they are in a position to regulate the government," the Senator said.

Of course, he added, it was not proper to assume that the United States government could not at any time regulate anything within the scope of its authority, nevertheless public utilities could do a good deal to influence the action of the government.

"When they go out and elect a man to office," Senator Barkley said, "it is a fair assumption that it is not entirely a matter of philanthropic endeavor on their part, but in view of what he may be able to do for them in return."

Manton Davis, vice-president and general attorney of the Radio Corp. of America, on December 16 indorsed the suggestion of James G. Harbord, president of the corporation, which would permit a proposed federal communications agency to approve rates established by private negotiation between an American and a foreign communications company.

Testifying before the committee, Mr. Davis emphasized that rates for international service must result from negotiation, not from orders of a single nation.

He said that competition between American companies, like that across the Pacific ocean, would not necessarily lower the rate to Japan, because that country had a voice in the matter. It might, however, he added, result in Japan taking a lion's share of the tolls and permit her to say which American station shall live and which shall die.

What the Commissions Are Doing

Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

Ohio Companies Take Controversy Into Common Pleas Court.

A controversy between two Independent rural and village telephone companies of Huron county, Ohio, has been carried into the common pleas court at Norwalk for settlement. The Greenwich Farmers Telephone Cc. is the plaintiff and asks the courts to force H. J. Parratt, one of the defendants, to cease taking service from the Clinton Air Line Telephone Co. at Fitchville, the other defendant.

Encroachment of territory is set forth by the plaintiff company. Mr. Parratt lives on the township line road between Ripley and Fairfield township. Since July 1, this year, he had been served by the Greenwich Farmers Telephone Co., but at that time he switched over to the Fitchville company.

In its petition, the Greenwich Farmers company asks the court to issue an injunction against both defendants.

The plaintiff company serves patrons in Greenwich, in the following townships: Greenwich, Ripley, Fairfield and Fitchville and also territory in northern Richland county.

Bell of Canada Reduces Toll Rates First of Year.

The Bell Telephone Co. of Canada will reduce its long distance telephone rates, effective January 1. The last reduction in toll rates was February 1, last. On the present volume of business, more than $200,000 annually will be saved to customers in the provinces of Ontario and Quebec.

The company's program of extensions and improvements for 1930 will involve $30,000,000, the largest on record and $3,000,000 above the 1929 program.

Bell Reduces Charges in Northwest About $300,000 Annually.

Reductions in telephone charges have just been announced by the Pacific Telephone & Telegraph Co. in its Northwestern territory, including the states of Washington. Oregon, and part of Idaho, which will save telephone users about $300,000 a year. The reductions take effect January 1.

The reductions apply to such items as service connection charges, moving charges, business and residence extension telephone

rates, rates applying to subscribers remote from the central office, and rates for hand sets. Examples of some of the reductions follow:

The $1.50 service connection charge for connecting service when the instrument is in place will be eliminated provided incoming and outgoing calls can be made at the time the new subscriber applies for service.

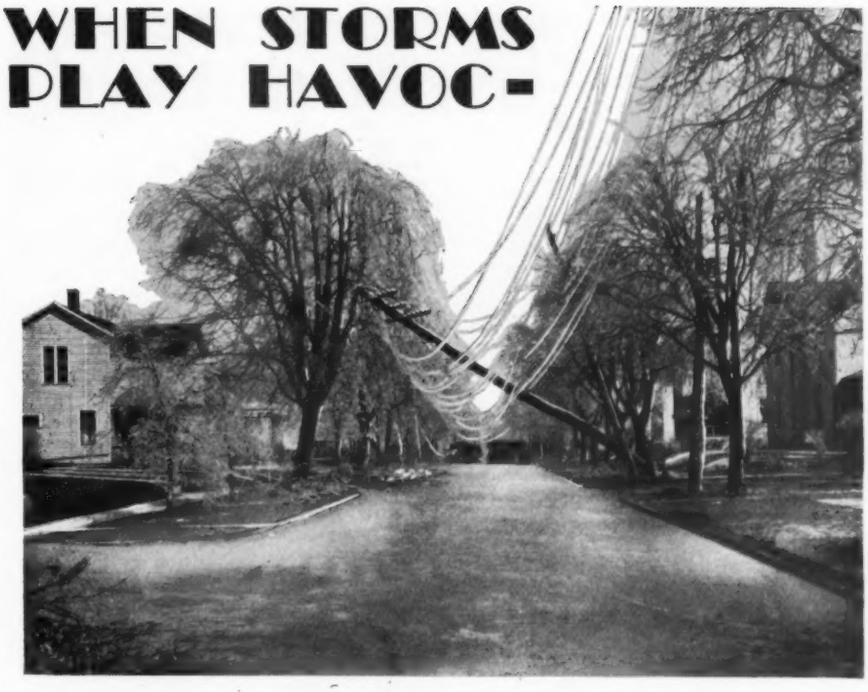
In Oregon the service connection charge for business and residence extension telephones is reduced from $2.00 to $1.50; for private branch exchange telephones the rates are reduced from $3.50 to $2.50 in various parts of the state to $1.50; for main residence telephones from $3.50 to $3.00.

In Washington the service connection charge for business extension telephone is reduced from $3.00 to $3.50 in various parts of the state to $1.50; for main residence telephones service connection charge is reduced from $3.50 to $3.00; and for residence extension telephones from $3.00 to $3.50 to $1.50.

Reductions in extension telephone rates applying to wall and desk types amount to 25 cents a month.

RATE CHANGES IN OREGON.

	Rates in effect prior to December 31, 1929.	Rates effective January 1, 1930.
Business, flat extension stations, desk set	$1.25	$1.00
Business, flat extension stations, wall set	1.00	.75
Business, coin box extension station, without coin box, desk set	1.00	.75
Business, coin-box extension stations, without coin-box, wall set	.75	.50
Semi-public extension stations, desk set without coin box	1.00	.75
Semi-public extension stations, wall set without coin box	1.00	.50
Residence flat extension station, desk set	1.00	.75
Residence flat extension station, wall set	.75	.50
Moving subscribers' telephone sets (not in the same room)	2.00	1.50
Moving P. B. X. system per station (not in same room)	2.00	1.50
Service connection charge, P. B. X. station (over 1,000 stations)	3.50	1.50
Service connection charge, P. B. X. station (under 1,000 stations)	2.50	1.50
Service connection charge, business extension (over 1,000 stations)	2.00	1.50
Service connection charge, residence primary (over 1,000 stations)	3.50	3.00
Service connection charge, residence P. B. X. trunks (over 1,000 stations)	3.50	3.00
Service connection charge, residence P. B. X. station (over 1,000 stations)	3.50	1.50
Service connection charge, residence P. B. X. station (under 1,000 stations)	2.50	1.50



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Service connection charge, "change in name" (under 1,000 stations)	1.00	....

RATE CHANGES IN WASHINGTON.

	Rates in effect prior to December 31, 1929.	Rates effective January 1, 1930.
Business, flat extension stations, desk set (Seattle, Tacoma and Spokane)	$1.25	$1.00
Business, flat extension stations, wall set (Seattle, Tacoma and Spokane)	1.00	.75
Business, flat extension stations, desk set (other exchanges)	1.00	1.00
Business, flat extension stations, wall set (other exchanges)	1.00	.75
Business, measured extension stations, desk set (Seattle, Tacoma and Spokane)	1.00	.75
Business, measured extension stations, wall set (Seattle, Tacoma and Spokane)	.75	.50
Semi-public, extension stations, desk set, without coin box (Seattle, Tacoma and Spokane)	1.25	.75
Semi-public, extension stations, wall set, without coin box (Seattle, Tacoma and Spokane)	1.00	.50
Semi-public, extension stations, desk set, without coin box (other exchanges)	1.00	.75
Semi-public, extension stations, wall set, without coin box (other exchanges)	1.00	.50
Residence, flat extension stations, desk set (Seattle, Tacoma and Spokane)	1.00	.75
Residence, flat extension stations, wall set (Seattle, Tacoma and Spokane)	.75	.50
Residence, flat extension stations, desk set (Puyallup)	.75	.75
Residence, flat extension stations, wall set (Puyallup)	.50	.50
Residence, flat extension stations, desk set (other exchanges)	1.00	.75
Residence, flat extension stations, wall set (other exchanges)	.65	.50
Residence, flat extension stations, desk set, without bell (other exchanges)	.75	.75
Residence, flat extension stations, wall set, without bell (other exchanges)	.50	.50
Service connection charge, P. B. X. station (Seattle, Tacoma and Spokane)	3.00	1.50
Service connection charge, P. B. X. station (Puyallup)	1.00	1.00
Service connection charge, P. B. X. station (other exchanges)	3.50	1.50
Service connection charge, P. B. X. trunks (Seattle, Tacoma and Spokane)	5.00	3.50
Service connection charge, business extension (Seattle, Tacoma and Spokane)	3.00	1.50
Service connection charge, business extension (Puyallup)	1.00	1.00
Service connection charge, business extension (other exchanges)	3.50	1.50
Service connection charge, business primary (Seattle, Tacoma and Spokane)	5.00	3.50
Service connection charge, residence primary (all exchanges)	3.50	3.00
Service connection charge, residence extension (Seattle, Tacoma and Spokane)	3.00	1.50
Service connection charge, residence extension (Puyallup)	1.00	1.00
Service connection charge, residence extension (other exchanges)	3.50	1.50
Service connection charge, "change in name" (all exchanges)	1.50	....

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

November 29: Acquisition by the Ohio Bell Telephone of the properties of the Wintersville Telephone Co. found to be of advantage to the persons to whom service is to be rendered and in the public interest. The Wintersville company owns an exchange at Wintersville, Jefferson county, Ohio, which served 99 subscriber stations as of December 31, 1928.

November 30: Bell Telephone Co. of Pa. authorized to acquire the properties of the Bear Gap & Numidia Telephone Co., Elysburg, Pa., which serves 283 subscriber stations.

November 30: New Jersey Bell Telephone Co. authorized to acquire the properties of the Middlesex Telephone Co., which owns and operates an exchange at Monmouth Junction, N. J., which serves approximately 250 subscriber stations and 7.5 pole miles of toll lines.

December 17: Hearing in the matter of the application of the Michigan Bell Telephone Co. for authority to acquire the properties of the Benzie-Consolidated Telephone Co., serving Benzonia, Frankfort, Thompsonville and vicinity, a total of 422 owned and 30 service stations, and toll line property between those villages.

December 17: Hearing in the matter of the application of the Ohio Bell Telephone Co. for authority to acquire the properties of the Chester Telephone Co., operating in Chesterland, Geauga county, Ohio.

December 17: Hearing in the matter of the application of the New England Telephone & Telegraph Co. for authority to acquire control of the Windham County Telephone Co., operating in the towns of Jamaica, Landgrove, Londonderry, Peru, Stratton, Townshend, Wardsboro, Weston, Williamsville and Windhal, in Vermont.

December 17: Hearing in the matter of the application of the New Jersey Bell Telephone Co. for authority to acquire the properties of the Farmers & Traders Telephone Co., operating 1,289 stations in the township of Plainsboro, Middlesex county, the township of Cranbury, Middlesex county and in the borough of Highstown, Mercer county, all in New Jersey.

December 17: Hearing in the matter of application of the Northwestern Bell Telephone Co. for authority to acquire the properties of Gertrude A. Fox, doing business as the Warroad Telephone Co., with exchanges at Warroad and Beaudette, Minn.

CALIFORNIA.

December 9: The Pacific Telephone & Telegraph Co. authorized to purchase the remaining 35 shares outstanding of the common capital stock of Northern California Telephone Co. for the sum of $3,500. This purchase makes the Pacific company owner of all of the outstanding stock of the Northern company.

December 9: Northern California Telephone Co. applied for authority to transfer its properties and assets to the Pacific Telephone & Telegraph Co. for the sum of $1.00, the Pacific company now being the owner of all of the outstanding capital stock of the Northern company. It is proposed that the Pacific company shall operate in the territory, including Colusa, Glenn, Lake, Mendocino, Napa, Sonoma and Tehama, now served by the Northern company.

December 10: E. J. Gann, doing business under the name of Mariposa Telephone Exchange, applied for authority to sell his telephone exchange in the town of Mariposa, to James J. Dulcich, and the latter applied for authority to acquire and operate the system.

ILLINOIS.

December 17: Hearing at Springfield in the matter of the proposed advance in rates for service of the Illinois Telephone Co. in Greenfield, Roodhouse and White Hall, stated in rate schedule Ill. C. C. No. 4, rendered by the Illinois Telephone Co.

December 17: Hearing at Springfield before Chairman Hadley in the matter of application by Pike County Telephone Co. for authority to acquire all of the capital stock of the Calhoun Telephone Co.

December 18: Hearing before Commissioner Gilbert in the matter of the proposed advance in rates for service of the Illinois Bell Telephone Co. in Decatur, stated in rate schedule Ill. C. C. No. 2, filed by the company.

INDIANA.

December 4: Petition filed by Attica Telephone Co., Attica, asking for an increase in rates. Petition states that a depreciation of $116,440 has been suffered by the company.

December 6: Increase in rates for Citizens Independent Telephone Co., Terre Haute, approved. Business rate increased to $7.75 and the residence to $3.75, providing a total gain in revenue of $96,000 a year.

December 6: Winona Telephone Co. of Plymouth authorized to buy the Tyner Telephone Co. for $8,000.

December 6: Rochester Telephone Co. authorized to issue $65,000 of common stock and $25,000 worth of preferred stock.

December 6: Reduction in long distance rates of Indiana Bell Telephone Co. approved. This will affect principally station-to-station day rates on calls.

December 7: Petition of Northern Indiana Telephone Co. to dismiss its complaint against 16 state telephone companies approved.

December 9: Petition filed by Indiana Bell Telephone Co. asking approval of purchase of the Cooperative Telephone Co. of Albany, for the sum of $43,933.86. A majority of stockholders of the company agrees to the sale, the petition states.

KANSAS.

December 2: Application granted of Bushton Telephone Co. for permission to issue additional stock in the amount of $2,800.

December 13: Application granted of the Lost Springs Mutual Telephone Co. for a certificate of convenience and authority to transact the business of a telephone utility at Lost Springs.

December 13: Application granted of Lost Springs Mutual Telephone Co. for permission to change its rates for service at Lost Springs.

December 13: Application granted of Aurora Telephone Co. for permission to

change its rates for service at Aurora.

December 13: Application granted of United Telephone Co. for permission to discontinue its magneto service at its exchange at Concordia in the city limits.

December 16: Hearing in the matter of application of the Central Kansas Telephone Co. for permission to issue its common stock, its preferred stock and its first mortgage bonds in the amount of $232,000.

December 16: Hearing on application of American Telephone Co. for a certificate permitting it to issue its common and preferred stock and its first mortgage bonds in the amount of $107,050.

KENTUCKY.

December 12: Petition dismissed of Northern Kentucky Mutual Telephone Co., Bracken county, which sought to compel the Southern Bell Telephone & Telegraph Co. to afford connection with its lines for the interchange of messages between certain points.

MICHIGAN.

December 5: Sale of one-fourth interest in a toll line plant which extends west to Dowagiac from a point two miles east of Marcellus and one west from Cassopolis by the Michigan Bell Telephone Co. to the Tri-County Telephone Co. authorized. The price will be $3,380.

December 5: Petition of city of Adrian for a rehearing on a rate increase recently granted the Tri-County Telephone Co. refused.

December 6: Purchase by the Michigan Bell Telephone Co. of several small telephone lines and exchanges in and around the village of Leland, Leelanau county, approved. Among the smaller telephone lines to be sold are the Leland Roadway Telephone line No. 2 and Leland roadway No. 6 The Michigan Bell company was also granted permission to purchase the Beaverton exchange in Beaverton, Gladwin county, and to extend its rural line rate schedule to the Lake Leelanau exchange.

December 19: Hearing on petition of the Michigan Home Telephone Co. for permission to increase its rates at Muskegon. The company claims it is entitled to a fair return on a valuation of more than $1,500,000, and asserts that present rates are not returning sufficient revenue.

December 20: Hearing on application of Leighton Telephone Co. for an increase of rates at Corning.

MISSOURI.

December 5: After a hearing in the matter of the commission of its own motion; complainant, vs. the Farmers Mutual Telephone Co. of Maitland, defendant, the commission authorized the company to file its schedule of rates and rules, effective January 1.

December 7: Application approved of George E. Dice and J. M. Roberts for consent to a proposed sale of the Altamont Telephone System, Altamont.

December 9: Application approved of Osage Valley Telephone Co. for permission to file toll rate schedule between points served by the company toll lines in Cedar, Hickory, Polk and St. Clair counties.

December 20: Hearing at Bosworth on commission's order of December 10 to the Citizens Public Service Co. to show cause why it had failed to comply with a commission order last September for rebuilding and rehabilitation of the company's telephone exchange in Bosworth, Mo., and for improvement of the telephone service there. The Citizens Public Service Co. which owns several small telephone properties, has headquarters in Jefferson City.

The commission stated in its order of December 10 that the telephone rates in effect in Bosworth were sufficiently compensatory for adequate and satisfactory

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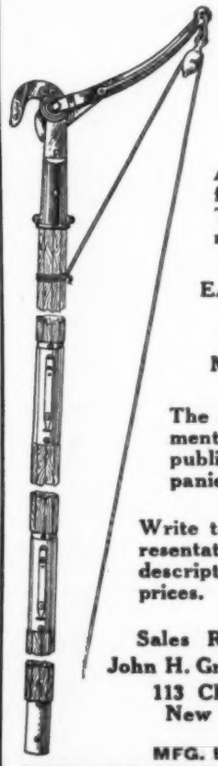

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service and that if the order for the improvements was not complied with it would institute an investigation to determine what would be reasonable rates for the service actually rendered.

NEW YORK.

December 9: The commission approved the transfer from the Thompson Ridge Telephone Co., a small rural line serving about 60 customers in Crawford, Orange county, of the franchise granted to it by the township, to the Orange County Telephone Co., of Middletown, which has purchased the physical property of the Thompson company. The latter serves a farming community about 10 miles from Middletown. Evidence submitted at a hearing before Commissioner Van Namee was to the effect that the transfer of the franchise and property would result in better service in Crawford.

OHIO.

December 6: Mansfield Telephone Co., incorporated this year, filed application for approval of plan for the company's purchase of properties of the Mansfield Telephone Co., incorporated in 1898. The properties are valued at $2,195,182.79. The company incorporated this year proposes to issue to the other company 30-year sinking fund, 5 per cent gold bonds, with a par value of $1,021,500, and 30,000 shares of its common stock, without par value, in full payment for the properties. The property involved serves customers in Richland, Ashland, Crawford, Morrow, Knox and Huron counties.

December 10: Hearing resumed on Cambridge Home Telephone Co.'s plea for increased rates.

December 11: Athens Home Telephone Co. filed application for authority to increase schedule of rates to provide for automatic exchange service, displacing the present private branch exchange service, necessitating new equipment to cost approximately $7,000.

OKLAHOMA.

December 17: Hearing indefinitely postponed involving the investigation relating to rules and regulations governing ownership of telephone equipment by telephone companies.

December 17: Hearing postponed in the matter of the Ketchum Hotel vs. the Southwestern Bell Telephone Co., application of the hotel company for authority to install its own P. B. X. board and to fix rates for trunk lines.

WISCONSIN.

December 7: Lisbon Telephone Co. of Sussex authorized to issue notes for the purpose of securing funds with which to retire a first mortgage now outstanding against the property amounting to $1,000.

December 7: Peoples Telephone Co. of Mount Hope granted authority to issue $20,000 principal amount of its five year 6 per cent notes dated February 1, 1930.

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During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals 750. Would you like to avail yourself of my services?
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KANSAS CITY, MISSOURI
Eighty-sixth Consecutive Quarterly Dividend
The regular quarterly dividends of 40c a share on the No Par Preferred stock and the usual dividend on the Common stock has been declared payable January 1, 1930, to the stockholders of record as of the 31st day of December, 1929, at 3:00 p. m. The books will be closed to transfer on December 15th and re-opened on January 1, 1930.
(Signed) C. A. BENNETT, Senior Vice-Pres. and Treas.
December 12, 1929.

PEARL Life-time Drop-Wire BRACKETS
Save time, eliminate trouble. Hot galvanized screw-hooks and malleable castings are separable and indestructible. Standard 2-groove porcelain. Stocked by Telephone Manufacturers.
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Non-Chaffing Cable Ring Saddles
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Condensed Telephone News

Companies Are Urgently Requested to Forward to Us Promptly News Concerning Construction, Rebuilding, Financing, Election of Officers, Sales and Purchases of Exchanges or Other Activities

Financial.

MONTREAL, QUE., CANADA.—The Bell Telephone of Canada has declared its regular quarterly dividend of $2, payable January 10 to stockholders of record December 23.

CHICAGO, ILL.—The Middle West Telephone Co. recently declared an initial quarterly dividend of 43¾ cents on its Class A common stock.

CHICAGO, ILL.—A dividend of $2 per share was declared recently at a meeting of the board of directors of the Illinois Bell Telephone Co., payable December 31, 1929, to stockholders of record December 30, 1929.

SEYMOUR, IND.—Officials of the Southern Indiana Telephone & Telegraph Co. have filed papers with the secretary of state in Indianapolis changing and subdividing its 4,000 shares of no par value stock into 10,000 shares of no par value stock, thus increasing the shares 6,000 in number without increase of capital stock.

Construction.

DOUGLASS, KANS.—The reconditioning of the Empire Companies' telephone and telegraph line between Douglass and Dilworth, Kans., is approximately 75 per cent complete. Under the direction of G. L. Johnson the work is progressing rapidly. With the completion of this work the line, which is part of the private system of the Empire Companies, of Bartlesville, Okla., will be strengthened against the ravages of winter such as snow, sleet and ice.

It was necessary to set 800 new poles and string some new wire. Some of the poles were cut off and reset in reconditioning this line.

EDGERTON, WIS.—The Commonwealth Telephone Co. broke ground here for its new telephone exchange building recently, in the presence of F. H. Runkel, general manager; O. B. Blackwood, commercial agent, and A. F. Smith, Madison, all representatives of the Commonwealth Telephone Co.

The new building will be located on the Larson lot at the corner of North Henry and Canal streets. It will be constructed of red brick and concrete and will be about one and one-half stories high with basement.

Modern telephone and office equipment throughout will be installed, including a new common battery switchboard.

It is estimated that the building and equipment will represent an investment of $50,000.

Miscellaneous.

CORDOVA, ILL.—Maynard Allen, manager of the Cordova Telephone Co., was recently married to Miss Marie Woodward.

STAUNTON, ILL.—Manager J. C. Wall of the Staunton Telephone Co. has arranged with the Star-Times for a series of advertisements covering a period of a year.

STREATOR, ILL.—The cutover of the Streator exchange to automatic service scheduled for December 18, has been postponed to December 27. During the week preceding Christmas the telephone traffic is heavier than at any other time during the year, so in order to have as little confusion as possible for patrons of the telephone company, it was deemed advisable to postpone the change.

BROOKNEAL, VA.—The Brookneal, Altavista and Rustburg divisions of the Virginia-North Carolina Telephone Co. held a meeting last month at the home of the superintendent, Leo B. Elwood, Altavista, for the purpose of discussing better ways of business and service to the public.

Interesting talks were made by Miss Pearl Jones, chief operator of Brookneal and Miss Bertha Roark, chief operator, of Altavista, also T. R. Atkins, line foreman. Superintendent Elwood gave new rules recently passed by the company, after which there was a round table discussion and plans were made to hold similar meetings quarterly.

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TRAFFIC SIGNALS
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EVER-PROTECT CABLE COMPOUND
EFFECTIVE *in maintaining your underground and aerial cable in perfect condition*
NATIONAL CABLE COMPOUND CO.
MITCHELL INC. INDIANA

Creosoted Wood Conduit
Railroad Ties, Bridge Timbers, Piles, Poles, Paving Blocks and Lumber—Manufacturers of Cross Arms, Signal Trunking and Wyckoff Conduit for Underground Wires.
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Mentioning TELEPHONY gives your inquiry tone.

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"REBUILT" when connected with PREMIER means something.

RECONSTRUCTED EQUIPMENT

Kellogg magneto desk sets with inside connection New cabinet signal sets, 3-bar 1000 or 1600 ohm @ $10.00—4-bar $10.75—5-bar @	$11.50
Am. Elec. Burns Express drops and jacks @	1.50
Swedish Am. 5-bar 1000 or 1600 ohm Bdg. compacts @	7.50
Western Elec. No. 20 C. B. Ind. Coils @	.35
Automatic Elec. 2-M. F. Condensers @	.30
Monarch 4-bar 1000 or 1600 ohm Bdg. compacts @	7.00
Leich Elec. Co. pole changer, operates off 24-volt Batt. Ckt. @	20.00
H. C. Motor Gen. Ringing machine, operates off 110-volt A. C. light Ckt. @	70.00
Stromberg-Carlson Local Battery transmitters with back @	.90
Kellogg No. 97 C. B. desk sets complete with No. 259 or No. 404 Steel signal sets @	7.00

Write for Bulletins

REBUILT ELECTRIC EQUIPMENT CO.

1940 West 21st Str., Pilsen Station, Chicago, Ill.

HELP WANTED

ENGINEERS—Electrical or mechanical engineers or equivalent applicants should have a knowledge of the fundamentals of magnetism, A. C. and D. C. currents, some radio experience will be helpful. Steady employment with good opportunity for advancement. Write stating age, education, and experience. Box 955, Room 200, Times Bldg., New York City.

WANTED—Salesman to sell Western Red Cedar Poles. State experience. Address 7643, care of TELEPHONY.

POSITIONS WANTED

POSITION WANTED—Wire chief employed, desires change. 15 years' experience. Expert Kellogg, Western Electric equipment. Installer. Draftsman. Manager. Good character. Best reference. Address 7639, care of TELEPHONY.

POSITION WANTED — Competent, reliable telephone man desires permanent position. References. Reasonable salary. Not now employed. Address 7628, care of TELEPHONY.

WANTED POSITION — Telephone man who knows his work and is not afraid to do it, wants position. Can best qualify as wire chief, trouble-man, installer, line man, or any combination of these. Years of experience on magneto and common battery, local and toll, outside and inside. Some automatic experience. References furnished or will come on trial. Go anywhere—reasonable salary. Address 7621, care of TELEPHONY.

POSITION WANTED — Competent telephone man, experienced in all branches, desires position as Engineer, Supt. or Mgr. Best of references. Address Louis Mühlheizler, 175 North Cicero Ave., Chicago.

POSITION WANTED—General or district manager of group of exchanges; 31 years' experience; technical education. Will consider leasing an exchange with privilege of buying. Address 7640, care of TELEPHONY.

NEW

GREEN CORDS

2 conductor stand cords	$ .25
3 conductor stand cords	.35
4 conductor stand cords	.45
5 conductor stand cords	.55
Kellogg No. 26-D operator's cord	.35
Kellogg No. 67-D operator's cord	.55
Kellogg No. 239 operator's cord	.55
New Western Electric Co. green, red or white 2 conductor switchboard cords for S.C. No. 57 plug, 72-inch	.35

Buckeye Telephone & Supply Company

1432 S. Parsons Ave. COLUMBUS, O.

FOR SALE

W. E. 24-VOLT switchboard lamps @ $10.00 per 100. Bakelite mouth-pieces for W. E. Transmitters @ $6.00 per 100. Armatures for W. E. No. 22 generators @ 75c, for W. E. No. 47 generators @ $1.00, for W. E. No. 48 generators @ $1.25. Monarch Ring, Listen and Ring-back Keys @ $1.00. No. 17 parallel bronze drop wire @ $6.50 per 1000 feet. **The TELEPHONE REPAIR SHOP** 6966 Ravenswood Ave., Chicago.

FOR SALE—Cook No. Ten Arrestors, perfect condition, complete with heat coils and carbons, 20 pr. banks, $3.50 each. Sample for approval. WHITTIER HOME TEL. & TEL. CO., Whittier, California.

FOR SALE—4 positions Western Electric Co.—1248 Common Battery Lamp Switchboards, equipped for 740 lines. One of these positions equipped with 15 pr. Universal Toll and Local Cord Circuits.

1 Mercury Arc Rectifier, 10 Amp. capacity.

1 Gasoline-Generator Set—24-36 volt—20 Amp.

75 No. 294 Western Electric Co. Sub-Sets, less receivers.

To move quickly this equipment can be bought cheap.

PETERSBURG TELEPHONE CO., PETERSBURG, VA.

FOR SALE—Telephone plant 400 stations. Income $8000. 7-room modern house included, $35,000 if taken soon. $20,000 will handle. Address 7635, care of TELEPHONY.

FOR SALE—Several small exchanges. Bargains. E. W. Rollins, Hall Street, Spartanburg, S. C.

FOR SALE—W. E. Desk Bells, 2 and 3 bar, 1000 and 2500 ohm, straight and biased ringers. Taken out account change to common battery. Address 7632, care of TELEPHONY.

FOR SALE—1 Thousand line Main Distributing Frame complete with 940 lines Reliable No. 101-A switchboard protectors, like new, price $300.00. CORWIN ELECTRIC CO., Indianapolis, Indiana.

FOR SALE—5700 second-hand No. 7-A Fuses, clean, tested and ready for service, for sale cheap. Lincoln Telephone & Telegraph Company, F. M. Strasser, Supervisor of Supplies, Lincoln, Nebraska.

PROGRAM SERVICE EQUIPMENT—Complete S-C and other equipment for above service. Price on this lot will permit you to enter this field. Address 7641, care of TELEPHONY.